THE MONTHLY

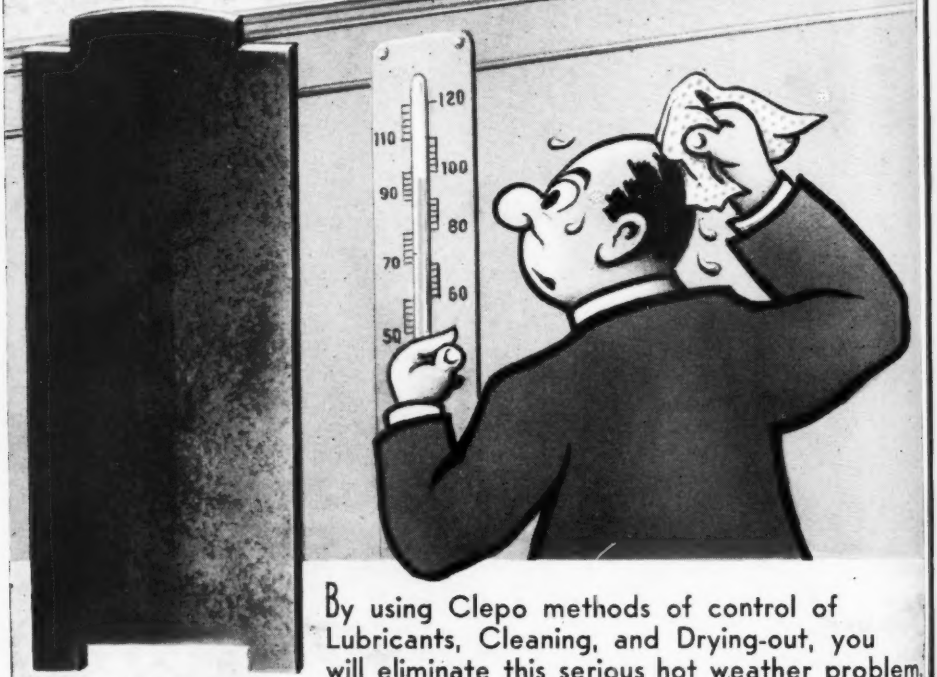
Review

Official Organ of the American Electroplaters' Society
A Society for the Advancement of the Science of Electroplating

AUGUST ✦ ✦ ✦ 1945

Steel Sweats Too!

RETARDING PRODUCTION AND ALSO CAUSING "REJECTS" DUE TO RUST.



By using Clepo methods of control of Lubricants, Cleaning, and Drying-out, you will eliminate this serious hot weather problem.

Also, Specialized Clepo compounds are available to eliminate spotting-out of plated finishes.

Put in your Call Immediately for a Clepo Service Man.

FREDERICK **GUMM** *Chemical Company Inc.*

538 FOREST STREET, KEARNY, N. J.

For a Quick... Low-Cost Way to Speed Up Surface Preparation of Steel and Copper Try Using

Oakite Composition No. 90

If you are doing bright zinc, cadmium, hard chrome, nickel, copper plating or applying black oxide or similar finishes to steel or copper, you will find Oakite Composition No. 90 for ANODIC degreasing of surfaces provides FIVE important advantages:

1. Fast, Thorough Smut Removal *2. High Conductivity*
3. Effective Wetting-Out and Emulsifying Action
4. Controlled Foaming *5. Long Solution Life*

FREE BOOKLET GIVES YOU DETAILS

A 16-page manual describes Oakite Composition No. 90 and gives you various applications, methods and directions for its use. Send for your free copy today . . . no obligation. When writing, also ask about scientifically designed Oakite materials and techniques to help you solve other surface preparation problems in connection with your war work.

OAKITE PRODUCTS, INC., 40 Thames St., New York 6, N. Y.

Technical Service Representatives Located in All Principal Cities of the United States and Canada

OAKITE Buy Bonds for Victory **CLEANING**

ENTHONE

ARE YOU TAKING ADVANTAGE OF THESE

METAL FINISHING SPECIALTIES?

ACID ADDITION AGENT

A liquid, surface active material for acid pickles to stop fuming, lower surface tension, displace oil films, promote smoother and better pickling of steel.

ENAMEL STRIPPER

Emulsion type strippers for stripping enamels from all metals without attack. Very fast acting. Two types—Enamel Stripper Regular—an emulsion type, and Stripper "F" which forms a clear dispersion with water and which is particularly good for stripping urea-formaldehyde type enamels. Alkaline strippers also available. (U. S. Patent 2,242,106)

ZINC STRIPPER

An alkaline process for very rapid stripping of zinc plating from steel without any attack on the steel. Process uses no current and is a simple immersion procedure. Zinc 0.001" thick stripped in a few seconds. Patent Pending.

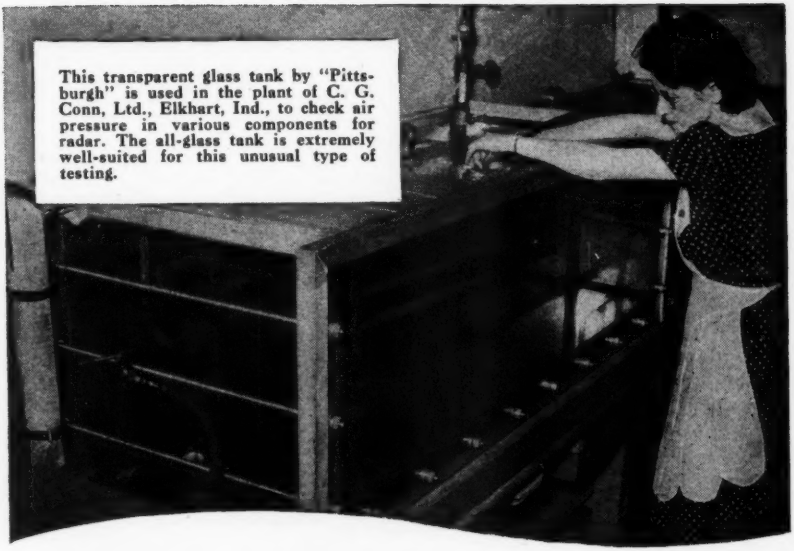
COMPOUND NR-37

A new organic rust inhibiting compound which when added to water prevents rusting. It stops rusting of steel immersed in water, and it is ideal to prevent rusting by water rinses after pickling. It stays in the water film until all the water is evaporated. No residue is left. Work with crevices and pockets can be dried free of rust using NR-37.

Free! Informative literature on Stripping, Pickling and Rust Prevention on Request.

ENTHONE

METAL FINISHING SPECIALTIES



This transparent glass tank by "Pittsburgh" is used in the plant of C. G. Conn, Ltd., Elkhart, Ind., to check air pressure in various components for radar. The all-glass tank is extremely well-suited for this unusual type of testing.

GLASS TANKS will do your Job!

GLASS TANKS by "Pittsburgh" have been used successfully for many unusual applications, such as the one shown above. But the durability and strength of glass tanks make them well-suited for *any* job where you need tanks that are impervious to almost all acids, alkalis, and chemicals. (Even hot chromic acid!) Whether you finish metal, process food, compound chemicals, or store liquids, there's a Pittsburgh Glass Tank for the job.

These tanks are made of specially tempered glass. They can withstand the shock of sharp temperature changes, and they have the strength and sturdiness for long service under hard usage. They are non-porous, non-absorptive, and they don't contaminate their contents. These features of glass tanks make them durable and economical. Long service is assured.

There is a wide variety of types and sizes available. Tanks faced with glass, inside and out. Tanks with glass inner facing only. Tanks made of transparent glass, or of colored, opaque Carrara Structural Glass. Also, your *present* tanks can be lined with glass. Send the coupon today for additional information.

"PITTSBURGH" stands for Quality Glass and Paint

Pittsburgh Plate Glass Company
2270-5 Grant Building, Pittsburgh 19, Pa.

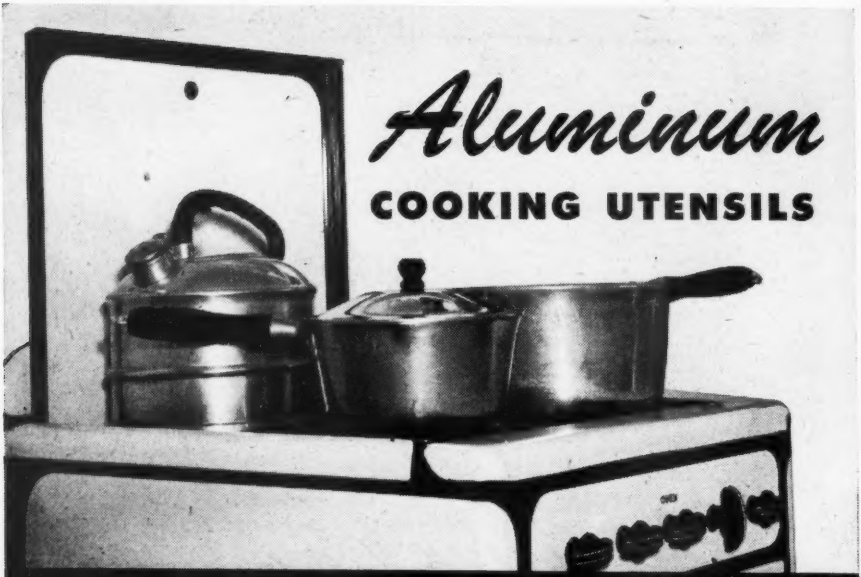
Please send me, without obligation, free literature on Glass Tanks by "Pittsburgh."

Name.....

Address.....

City..... State.....

PITTSBURGH PLATE GLASS COMPANY



Aluminum
COOKING UTENSILS

Photo by Ewing Galloway, New York

Millions of dollars (and hours) are going into the production of ALUMINUM COOKING UTENSILS—and other aluminum products for household use. Competition in this field will be exceptionally keen . . . the housewife will look for eye appeal as well as service in the items she purchases.

Why not use materials and methods which will assure you that the pieces YOU produce will meet HER exacting demands? A study of the chart below (taken from page 16 of our No. 27 Catalog) will serve as an excellent guide in helping you select the materials and methods for turning out the type of utensils she wants.

MATERIAL	POLISHING		BUFFING		FINISHING	
	On Set up Wheels	On Buffs	Hand Buffing	Automatic Machine	*Bright (Mirror)	Semi-bright (Satin, etc.)
Aluminum						
Castings	#2 Tallow		#20 Tripoli	#12 Tr.	FC Colg.	M Greaseless
Forgings	#2 Tallow		#70 Tripoli	#2 D. D.	HL Colg.	F Greaseless
Stampings			#73 Tripoli	#12 Tr.	HL Colg.	F Greaseless
Brass						
Castings	#1 Tallow	M Greaseless	Reg. #1 Trip.	#70 Tr.	HL Colg.	M Greaseless
Forgings	#2 Tallow	F Greaseless	Marvel. Trip.	#100 Tr.	HL Colg.	F Greaseless
Stampings			Marvel. Trip.	#100 Tr.	HL Colg.	F Greaseless
Copper			#8 D. D.	#12 Tr.	HL Colg.	F Greaseless
Die Castings			#20 Trip.	#14 Tr.	FC Color	F Greaseless

ABBREVIATIONS:
M-Medium. F-Fine. Tr.-Tripoli. D.D.-Double Duty. F.C.-Fast Cutting. HL-High Luster. Colg.-Coloring.

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BUFFING COMPOSITIONS • METAL POLISHERS AND ELECTROPLATERS SUPPLIES-EQUIPMENT

THE MONTHLY

Review

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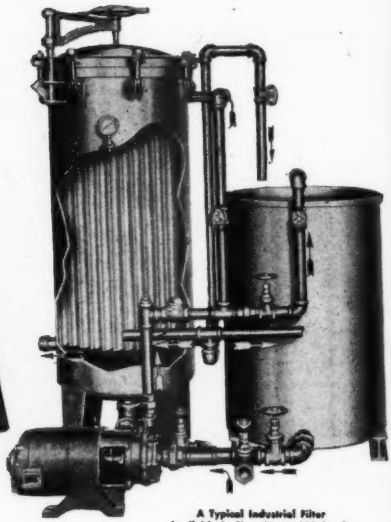


A Typical Industrial Filter
Available in Sizes Up to 290 Sq. Ft.
of Filtration Area

HERE IS GOOD NEWS FROM THE PLATING FRONT!

Industrial Plating Solution Filters are now coming equipped with AIRWASH — the new cleaning device that does a thorough job in a few minutes without opening the filter. You will welcome this new labor saving method of cleaning filters. The Industrial AIRWASH Device does a complete job of removing cake and sludge from filter cloths. There is no loss of time before starting the new filter cycle. Industrial Filters are furnished in sizes and models to fit your needs. Ask for our recommendations on the proper equipment to do your job better.

SALT FOG
Corrosion Test Equipment

This modern instrument is designed to meet all requirements of latest "Salt Fog Testing Procedure Specifications" to determine corrosion resistance of plated, coated, lacquered or painted parts.

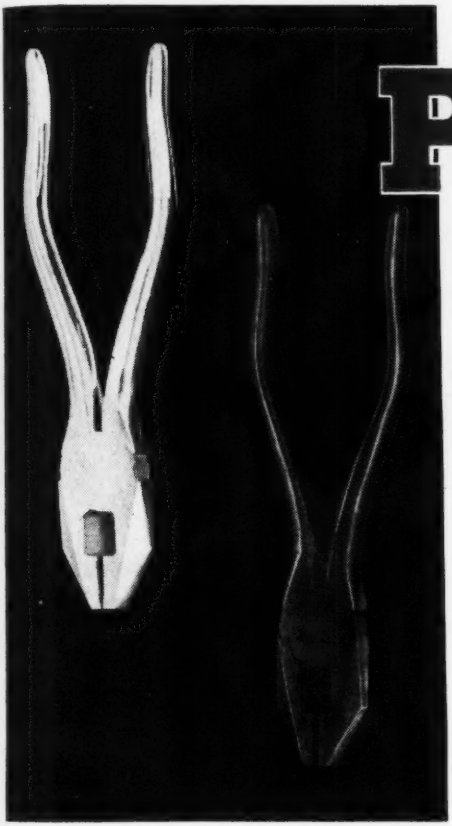
Serious rejection losses on industrial finishes which must meet Army or Navy specifications are avoided by systematic tests with Industrial Salt Fog Test Equipment.

STANDARD SIZES

No. 1—48" long 26" wide 36" deep No. 3—30" long 18" wide 30" deep
No. 2—36" long 24" wide 30" deep No. 4—24" long 15" wide 30" deep
No. 6—14" long 12" wide 12" deep

INDUSTRIAL FILTER & PUMP MFG. CO.

1621-25 WEST CARROLL AVENUE CHICAGO 12, ILLINOIS



Powerful

IS THE WORD FOR LUSTER-ON'S APPEAL

Wherever they're displayed, tools or parts treated with Luster-on* stand out. Laid beside ordinary zinc-plated parts they are different as day from night, as clearly shown in this unretouched photograph.

Yet Luster-on* is an inexpensive, easily-applied chemical bright dip for use on zinc — a simple, cold dip process that gives a passive surface, resistant to corrosion, age-stains, fingermarking or ordinary darkening. Luster-on* gives tools a chromium brilliance that catches the customer's eye — and a lasting protection that keeps him happy.

Luster-on* is a postwar zinc finish — available now in any quantity. It will put punch in your sales program.

●

KEMO SAYS:
Send us a sample of your zinc-plated items for free processing with Luster-on*. See the improvement with your own eyes.

*Patent applied for

THE Chemical CORPORATION
54 Waltham Ave., Springfield 9, Mass.

THE CHEMICAL CORPORATION
54 Waltham Ave., Springfield 9, Mass.

Please send me full particulars about Luster-on* bright dip for zinc surfaces. I am (am not) sending sample part for free dip. No obligation, of course.

Name.....

Address.....

Monthly Review - August

*Ventilated NON-FRAYS

THE MARK OF QUALITY

Also RIPPLE SEWED CHAMPION PIECED BUFFS

Polishing Wheels and Burring Bobs for every Operation

We are engaged essentially in War Work

*Patent Nos. 2,027,863; 2,094,650; 1,573,961; Re. 19,894; 2,140,208

F.L.&J.C. CODMAN COMPANY

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PHILADELPHIA OFFICE, 1123 REAL ESTATE TRUST BLDG.

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FOR FASTER, better copper plating, it will pay *you* to investigate Du Pont's RH-661 *Potassium* High-Speed Copper Plating Process *right now!*

This process is *fast*—yields smooth, uniform, dense deposits of 0.001" or more, in normal commercial operation, in 10 to 15 minutes. With the RH-661 process, plating at 40-80 A/SF is equivalent to 80-160 A/SF for bivalent solutions.

And this process is *economical*. Drag-out recovery is practical. Solutions remain stable over long periods of time. Low-concentration Potassium RH-661 baths may be used for normal operating speed. Solutions are easily filtered. And with minor changes, regular cyanide copper plating equipment can be used.

For more details on how the Du Pont RH-661 *Potassium* High-Speed Copper Plating Process can serve *you*, just write E. I. du Pont de Nemours & Co. (Inc.), Electroplating Division, Wilmington 98, Delaware.

SIDESTEP INFLATION—STAMP OUT BLACK MARKETS!

DU PONT
CHEMICALS · PROCESSES
· SERVICE ·
for
ELECTROPLATING

DU PONT
Better Things for Better Living Through Chemistry

You Can't Make Money With a Half Done Job

. . . do the Whole Job and do it Right

Half done jobs cost you money by wasting time, labor and metal. So, don't stop with cleaning the metal alone —clean the plating solution, too. Both must be continuously clean to avoid pitting, spots and poor adhesion.

Darco S-51 is specially made for keeping plating baths continuously clean. Through adsorption Darco activated carbon purifies the solution of minute contaminants —grease, oil, soap, colloids and decomposition products —impurities that result in defective plating.

Darco does a big job at small cost. 100 gallons of solution a week can be purified for a few cents. No wonder Darco S-51 is the standard of the industry, used in the plating baths of many metals—bright nickel, cyanide zinc, cadmium, copper, iron, gold, silver.

Darco Activated Carbon is a fine black powder. It is used in conjunction with a filter. For detailed directions send for copy of an article, "Physical Removal of Impurities from Plating Solutions."

Try Darco today. You'll find it wets easily, mixes with the plating solution quickly. Order Darco S-51 from your dealer, or ask us for a sample.

(This trademark identifies the genuine. Accept no packages without it.)

DARCO

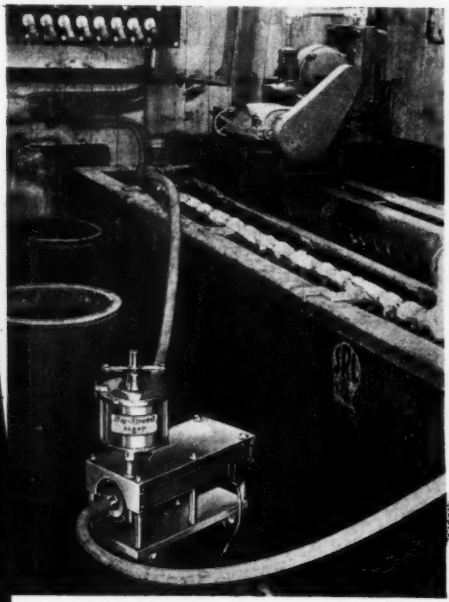
DARCO—REG. U. S. PAT. OFF.

DARCO CORPORATION

60 E. 42nd Street, New York 17, N. Y.

Is Your Plating Bath as Clean as the Water Used in Your Final Rinse?

The FILTER that Plating Shop Men Are Buying... ...ON ITS REPUTATION



YOU don't have to be sold on the necessity of operating the plating bath with a clean solution. It's a "must" for any shop where the objective is high quality work at the lowest possible cost.

Investigate the merits of the ALSOP "Sealed-Disc" Filter for this work. Each disc is a separate filtering element in itself, thus providing exceptionally large filter area and high capacity. High efficiency in removing solid impurities results from the graded density of the packed fibers. The layers graduate from loose-packed to close-packed. No filter aid is necessary. The filter is easily cleaned with no loss of solution.

The ALSOP "Sealed-Disc" Filter comes in many sizes, portable or stationary. In writing for information give your bath cleaning requirements. We'll be glad to recommend the proper type and size.

ALSOP *Engineering Corp.*

35 GRAND STREET

MILLDALE, CONNECTICUT

WITH

MEAKER EQUIPMENT

You are ready for Quick Conversion to Peacetime Decorative Plating . . . . .

Choose the plating equipment you install for war work with an eye on quick conversion to peacetime decorative plating.

MEAKER Full Automatic Machines are most flexible, and can be readily adapted to handle different size racks through an entirely new sequence. Transfer mechanism may be moved or made wider, or "lift" increased at a nominal expense. Unit may be lengthened by adding new sections, without junking any considerable part of the old machine.

MEAKER Equipment is simple, compact, accessible, and oversize to stand continuous operation.

THE MEAKER COMPANY

1635 South 55th Avenue • Chicago 50, Illinois

MEAKER EQUIPMENT

- Straight-a-way Full Automatic Plating Conveyors
- Return Type Full Automatic Plating Conveyor
- Semi-automatic Plating Machine
- Specially-designed Plating and Processing Machines
- Strip Steel Galvanizing Lines
- Round Wire Galvanizing Units
- Motor Generator Sets - Copper Oxide Rectifiers

Reflecting the Integrity of the Maker:

Each time you see the Harshaw trademark, whether on tank car, package or small laboratory bottle, remember it identifies chemicals that will help to do a better job . . . truly reflecting the integrity of the maker.

Harshaw will always guard the quality of its chemicals . . . chemicals which you identify by the Harshaw trademark . . . and which you buy with confidence. For more than 50 years Harshaw has persevered in ceaseless research and field investigation. As a result, thousands of manufacturers have been supplied with hundreds of different chemicals which have helped them . . . and which in addition have proved a source of satisfaction to them and to us.

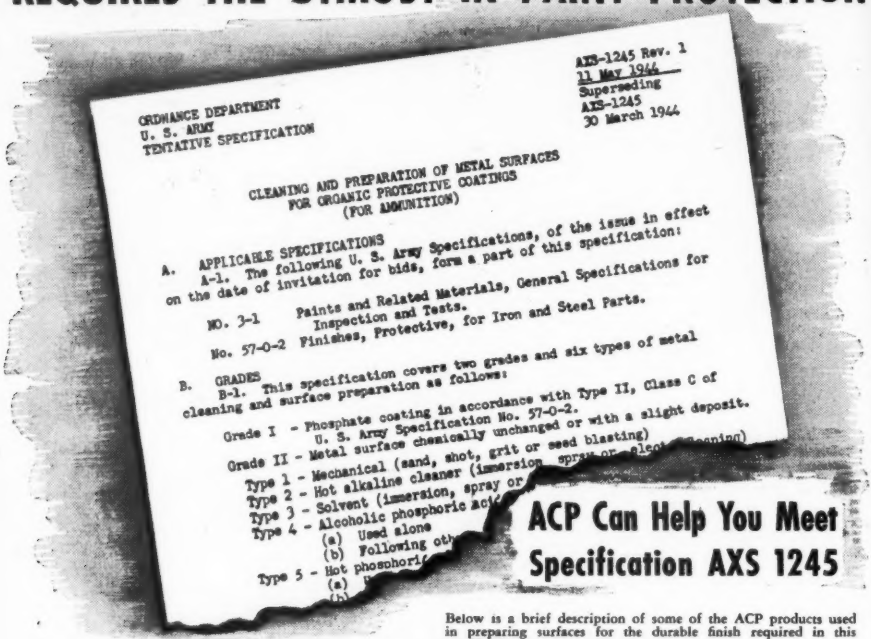
★ ★ ★ ★ **THE HARSHAW CHEMICAL CO.** ★ ★ ★ ★

1945 East 97th Street, Cleveland 6, Ohio

BRANCHES IN PRINCIPAL CITIES

WAR IN THE TROPICS

REQUIRES THE UTMOST IN PAINT PROTECTION


ORDNANCE DEPARTMENT
U. S. ARMY
TENTATIVE SPECIFICATION
AXS-1245 Rev. 1
11 May 1944
Superseding
AXS-1245
30 March 1944
CLEANING AND PREPARATION OF METAL SURFACES
FOR ORGANIC PROTECTIVE COATINGS
(FOR AMMUNITION)
A. APPLICABLE SPECIFICATIONS
A-1. The following U. S. Army Specifications, of the issue in effect on the date of invitation for bids, form a part of this specification:
NO. 3-1 Paints and Related Materials, General Specifications for Inspection and Tests.
No. 57-0-2 Finishes, Protective, for Iron and Steel Parts.
B. GRADES
B-1. This specification covers two grades and six types of metal cleaning and surface preparation as follows:
Grade I - Phosphate coating in accordance with Type II, Class C of U. S. Army Specification No. 57-0-2.
Grade II - Metal surface chemically unchanged or with a slight deposit.
Type 1 - Mechanical (sand, shot, grit or seed blasting)
Type 2 - Hot alkaline cleaner (immersion, spray or
Type 3 - Solvent (immersion, spray or
Type 4 - Alcoholic phosphoric ac
(a) Used alone
(b) Following oth
Type 5 - Hot phosphori
(a)
(b)
ACP Can Help You Meet
Specification AXS 1245

Our Technicians will be glad to assist you in adapting ACP products to meet Government Specification for metal cleaning and surface preparation for organic protective coatings. It is usually possible to adapt ACP products and methods of application to utilize your present equipment, thereby obviating delay and expense of new installations.

The experience of our technicians has enabled them to aid many manufacturers in overcoming serious difficulties in cleaning and conditioning ordnance as well as products for civilian use.

Below is a brief description of some of the ACP products used in preparing surfaces for the durable finish required in this specification.

DEOXIDINES—There are various grades and methods of application suited to the removal of varying amounts of rust and adapted to the different types of equipment in use.

DEOXYLYTE—For suitably adjusting the pH of rinse baths, properly, prior to painting.

RIDOSOL—An addition agent for improving detergent properties in emulsion cleaning.

PEROLINE—For preserving surfaces, in storage or transit, prepared properly for painting.

SOLVENT No. 3—Speeds stripping operations of paint, lacquer and enamel, in strong caustic baths.

RODINE—For inhibiting pickling acids.

Further information and technical data sheets will be forwarded on any of the above products. Address Dept. N-8.

MANUFACTURERS OF INHIBITORS AND METAL WORKING CHEMICALS

AMERICAN CHEMICAL PAINT CO.

AMBLER ACP PENNA.

Office and Warehouse
3665 Palmer Ave., Detroit, Mich.

Canadian Office and Factory
Walkerville, Ontario

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Los Angeles, Cal.

Metropolitan New York Area
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Eastern Ontario and Quebec
Van Camp Products & Sales Co.
177 Parliament St., Toronto, Ont.

CLEAN BRIGHT BRASS CLEANER

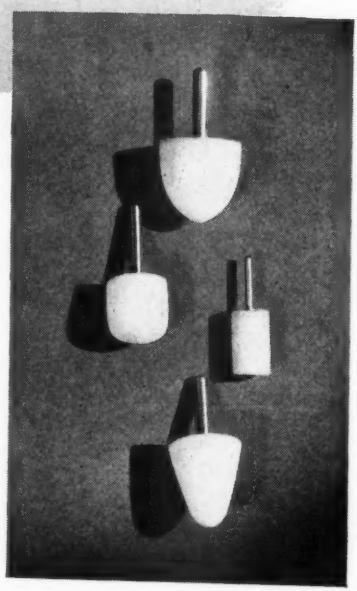
• A new outstanding COWLES CLEANER for non-tarnishing cleaning of polished and unpolished brass, copper and bronze in still tanks with or without electric current—also in all types of washing machine equipment. Cowles K W does not attack the metal. It is fast, efficient and economical. Immediate shipment from warehouse stocks.

Cowles
TECHNICAL SERVICE on request

THE COWLES DETERGENT CO.
METAL CLEANER DEPT.
7016 EUCLID AVENUE • CLEVELAND 3, OHIO

NOW YOU CAN BUY FELT BOBS

MOUNTED ON STEEL MANDRELS



Felt Bobs, as made by Bacon, Industry's oldest felt manufacturer, are pointing the way to faster work, fewer rejections and lower cost. Mandrel-mounted bobs, also made by Bacon, are opening the way to even lower cost. Operators waste no time in truing as this is done at the factory. Bob changes are made more rapidly; they can be readily setup with abrasive grains or faced with compounds.

The development of these Mandrel-Mounted Bobs is further evidence of Bacon Felt's service to industry. They complement an already extensive line of quality Felt Wheels and unmounted Felt Bobs.

If your supplier doesn't have Paramount Brand Felt Wheels and Bobs, let us know. We'll put you in touch with a supplier who can fill your needs or we will serve you directly.

PARAMOUNT BRAND

BACON FELT COMPANY

"America's Oldest Felt Manufacturers"

FELT DOES IT BETTER

Winchester, Mass. **Established 1824**

RECEIVING THE REVIEW?

In the short time since the writer took over the office of Executive Secretary, he has been surprised by the large number of letters which have been received citing failure to receive copies of the *Monthly Review.*

In some cases errors have been found in the addresses in the stencil file used for mailing the magazine. In other cases copies of the *Review* have been returned unclaimed, obviously because a change of address has occurred of which the Secretary's office has not been notified. In far too many cases the *Review* apparently is not received by the member and yet for some reason it is not returned to this office. This latter situation is outside our control and must be corrected by the member himself since evidently a third party is picking up the copy.

Every effort is being made to correct the situation in the Secretary's office. Both the membership and the stencil address files have been carefully checked and reorganized. As notification of changes of addresses are received, the files are being corrected as promptly as possible.

Realizing that members of the Society, as well as subscribers to the *Review* are equally desirous of correcting these difficulties, we are taking this opportunity to ask for your cooperation. Please notify your Branch Secretary or this office promptly and completely with respect to a change in mailing address. If possible this information should be received prior to effecting the change so that the *Review* can be received monthly without interruption. By so doing, the member is relieved of considerable annoyance and inconvenience and the Society saves extra postage and correspondence.

The Branch Secretaries can also be of great assistance in these matters. Forms are available for reporting changes in address and the Secretaries are urged to use these for prompt reports to the National Office on these matters.

In addition, the Branch Secretaries are requested to submit a corrected list of members and their addresses, with each quarterly payment of per capita tax as provided by the By-Laws. Secretaries of Branches who have not yet done so for the quarter ending in July are urged to send this information as soon as possible to this office.

A. K. GRAHAM, *Executive Secretary*

Electroplating Apprentices Receive U. S. Diplomas

Featuring the presence of Dr. William Blum, Chief, Electrochemistry Section, National Bureau of Standards, graduation exercises were held Thursday afternoon, July 12, in the office of the Washington area director of the War Manpower Commission for the first two apprentices to complete the apprentice training service courses in electroplating set up under the Federal Committee on Apprenticeship Standards in the District of Columbia.

The graduate apprentices were Willie Rowley, 30 years old, and John Samuel Brown, 31 years old, both of whom completed their three years apprenticeships at the Art Metal Finishing Company, of which F. F. Pierdon is manager. Mr. Pierdon was present for the occasion as was Gino J. Simi, District of Columbia Apprentice Training Service Representative, War Manpower Commission.

Formal presentation of the diplomas to the apprentice graduates was made by Ernest V. Connolly, area director of the War Manpower Commission. He said, among other things:

"This certificate attesting your completed apprenticeship is a letter of recommendation directly from the government of the United States and a letter of recommendation which will bear presentation anywhere

(*Continued on page* 790)

UNICHROME*

Alkaline Copper

FOR SMOOTH, SPEEDY PLATING TODAY, AN *"Ace In The Hole"* FOR TOMORROW

FAST PRODUCTION of lustrous deposits — is yours with Unichrome Alkaline Copper. Speed . . . smoothness of deposits . . . efficiency . . . and safety — have all been *proved* in the many large installations. And when you add economy of operation to these benefits, it's apparent why Unichrome Alkaline Copper will pay immediate dividends when it's time to meet post-war competition.

Look Into These Features

Unichrome Copper deposits are dense, unusually fine-grained, and adhere well. Their exceptional smoothness makes an excellent base without buffing prior to bright nickel. Where the base metal is rough, the plate can be buffed with minimum pressure.

In many plants today this process boosts production because of the high plating speeds obtained. A quick, simple cleaning cycle is used, and deposits need no activation before plating with other metals.

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ASTM Activities Of Interest To Platers

Several of the committee reports presented to the American Society for Testing Materials at its one day annual meeting, held in New York City on June 27, are of interest to platers.

Committee A-5 on Corrosion of Iron & Steel will include in its report, to be published by the Society during the summer, the results of atmospheric corrosion tests on wire and wire products after exposure for about 8 years at 11 test stations. Among the wires are those with zinc, lead, and copper coatings.

Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys has put out a new tentative method of Salt Spray (Fog) Testing, B-117-44T, which removes a great deal of the difficulties encountered in obtaining reproduceable results. The Spray Test Subcommittee under C. E. Heussner's chairmanship has formed a small section which is continuing the study of the important factors in salt spray fog testing. Among the members are C. H. Sample, N. E. Promisel, and Gustaf Soderberg.

The Subcommittee on Galvanic and Electrolytic Corrosion which has previously conducted some very extensive outdoor tests (results are covered in ASTM Proceedings) has plans for an outdoor corrosion study of the effect on magnesium alloys of contact with other metals, including solid nickel and steel plated with zinc and cadmium.

Committee B-8 on Electrodeposited Metallic Coatings, R. J. McKay, chairman, reports the results obtained during nearly one year of exposure of lead coatings on copper and on steel with and without copper undercoatings in New York City, State College, Pa., Kure Beach, N. C., and Tela, Honduras. Various changes are being proposed in the specifications under the Committee's jurisdiction, notably the addition of a new coating class to Tentative Specifications for Electrodeposited Coatings of Nickel and Chromium on Steel (A 166) calling for very heavy total thickness of nickel or copper plus nickel.

The Tentative Methods of Test for Local Thickness of Electrodeposited Coatings (A 219) is being revised to permit the use of magnetic methods and dropping tests (including one for lead coatings) when applicable.

Two new · tentative specifications have been completed and will be referred soon to the Society for approval, one for chromate finishes on zinc, and one for lead coatings on steel. The former requires a certain salt spray resistance after the chromate coating has been scratched through in a standard manner to expose the zinc in the scratch. The latter is a revised version of a former emergency specification.

Among the actions taken on the recommendation by Committee D-12 on Soaps and Other Detergents is the adoption as standard of the heretofore Tentative Methods for Chemical Analysis of Industrial Metal Cleaning Compositions (D-800).

Committee D-19 on Water for Industrial Uses reported that the work on the ASTM Manual on Industrial Waters is progressing.

The Society announced that 39 new tentatives, representing new work, were accepted for publication and that the annual meeting also approved for reference to letter ballot the adoption as formal standard of 44 existing tentatives.

ERRATA!!

Crystal Research Laboratories Still in Hartford, Conn.

Moving the A.E.S. office apparently did not make your Editors "moving" minded even with respect to typographical errors. As a result, in connection with his article in the July issue, "SUPERSONICS IN METAL FINISHING," the location of Mr. Jules Pinsky and the Crystal Research Laboratories slipped through as Stratford, Conn. The correct address, of course, is Hartford, Conn. Accept our apologies, please.—ED.

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AUTOMATIC SPRAY PAINTING

By R. H. WALLACE

Paasche Air Brush Co., Boston, Mass.

NOT since the introduction of manually operated spray painting equipment nearly a half a century ago has there been such rapid advancement in the technique of applying organic coatings as has been witnessed in the past few years.

Probably the most significant progress that has been made in recent years in the industrial application of paints, varnishes, lacquers and kindred coating materials has been in the field of automatic spraying.

Application

Obviously, automatic painting equipment best fulfills its function when high production is involved, but there are many occasions when even a relatively low production will warrant the use of this equipment as the most expeditious method of finishing a product.

One might have a production of as little as 100 pieces per hour, but because of areas to be shielded from the coated surface, several operators might be employed in masking and preparing the object for spraying. It is possible to design the work holders on the automatic painting machine to serve the dual purpose of holding the piece to be coated and also shielding the non-coated surface.

Another labor-saving factor in the case of low production is the elimination of conveying the product from a spray booth to a drying or baking oven. It is standard procedure to incorporate drying or baking facilities on the automatic machine.

Other advantages of automatic finishing are: large savings in materials, uniformity of finish, minimum amount of floor space required, clean operating conditions, savings in labor, and accurate control of costs.

For these reasons at the present time there are automatic machines in operation with hourly production capacities ranging from 100 pieces per hour to 12,000 pieces per hour.

Savings in Material

There is always a correct film thickness of coating to be applied to any given object. This factor has not in the past received the consideration it merits. Now it has assumed much more importance as in most instances film thickness and tolerances are specified on Government contracts for the coating of small arms munitions.

Manual spray application is subject to the spray operator's judgment and experience. This judgment and experience is a variable factor with each operator. The time cycle, and by that I mean the period of time an individual spray operator focusses his spray gun on the work, plus the fluid adjustment of his spray gun and air pressures used are usually matters left to the discretion of the individual spray operator. Obviously, there is a tremendous amount of wasted material going up through the exhaust stacks of the spray booths under such conditions. With automatic equipment, the duration of the spraying cycle is accurately controlled and maintained. The same is true of the material and air adjustments on the automatic gun. Hundreds of actual experiences have shown savings of material ranging as high as 500% by the use of automatic machines.

Because of the controllable factors mentioned, high standards of quality finish will also result.

Savings in Labor

Large savings in labor is a major consideration in justifying the use of automatic coating equipment.

As the spraying application is done automatically at a much more rapid rate than would be possible with manual application, the number of operators saved is of course dependent on the production of the particular automatic machine. In one instance an automatic machine producing 2,000

pieces per hour cut the number of operators from 14 to 2.

There is a further saving in labor by the elimination of traying and racking of the pieces to be sprayed and the time spent in conveying them to and from the manual spray booth. Also, if the article is to be force dried or baked the drying or baking equipment can be a part of the automatic machine, thus eliminating further handling of the work from spray booth to drying or baking oven. In many instances, the work can be unloaded automatically and in a few cases automatic loading can be worked out with a further saving in labor.

Savings in Floor Space

Another important point to consider in the use of automatic finishing equipment is the floor space saved. The sizes of automatic machines vary from a unit taking up a floor space 5′ x 3′ to a rather large unit requiring a floor space of 12′ x 6′. Machines of this type will displace manual spray booth equipment accommodating the same quantity of work but requiring ten to fifteen times the floor area.

Cleanliness

Modern waterwash spray booths are incorporated as a part of the automatic machines insuring clean, healthy operating conditions. It is a revelation to enter the finishing room of some large companies that have replaced a major portion of their hand spray booths with automatic equipment and note the cleanliness of the spray room compared to its previous untidy and firetrap conditions.

Cost Control

Lastly, but perhaps most important is the accurate control of finishing costs that can be maintained with the use of this type of equipment.

Products

The following shows the types of products best suited to this process. At the present time, such items as projectiles from 20 mm. to 105 mm., incendiary bombs, fuses, rifle grenades, bazookas, gas mask filters, rockets, land mines, scabbards, are coated inside and out in one continuous operation at production rates of from 1000 to 4000 pieces per hour.

Peace-time products such as lipsticks, clock cases, bezels, lighting fixtures, light sockets, golf balls, smoking pipes, footwear, book covers, clock dials, jewelry, battery boxes—these and hundreds of other items of this nature are but a few that readily come to mind. It is not necessary that the object to be coated be cylindrical. Many items being coated automatically today are of odd shapes and sizes. However, those mentioned and similar items can readily be handled on standard automatic machines.

There are some objects that because of their irregularity, bulkiness, or extreme weight, call for a special design of the automatic machine. However, the standard units have proved extremely flexible, and in 80% of the cases is the type of machine that is now doing the major part of the war work and will later be converted to peace-time projects.

Construction

At this point, it might be well to consider the standard automatic unit and how it functions. The machine consists of a square or rectangular frame, pressed from heavy gauge steel plates to make a smooth and continuous track for the conveyor chain. On the chain are spindles equi-distant from each other. On the standard unit, the distance of the spindles would normally be 3″, or any multiple thereof. By removing every other spindle, one may work on 6″ centers or by removing two spindles on 9″ centers. Thus, the machine has the flexibility to handle small or large objects. If a machine has been designed to produce 2000 pieces per hour on 3″ centers, but later 6″ centers are used, only ½ of the original hourly production would be obtained if the speed of the conveyor remained the same. However, the automatic machine is provided with the variable speed drive which may in some measure compensate for this loss of production.

Work fixtures are placed on the spindles to support the pieces to be finished. In many instances, the fixture not only supports the piece but also, as previously stated, performs the dual function of shielding areas not to be coated.

The conveyor moves in a clock-wise direction with a continuous motion. An operator stands to the right of the spray station loading the unfinished pieces into the work fixtures. The pieces to be coated then pass through a spray booth mounted to the conveyor frame, where a rotating mechanism

(*Continued on page* 843)

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A CASE OF EMBRITTLEMENT OF STEEL

From a Report by National Bureau of Standards to the War Production Board

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SUMMARY

A FAILED zinc-plated spring clip exhibited a stained fracture which was found to be partly intercrystalline in character in localized areas adjacent to spot welds. Such conditions are not inconsistent with the possibility that localized hydrogen embrittlement occurred during plating due to occlusion of molecular hydrogen in microscopic intercrystalline cracks produced in and near the welds during the welding operation. If the clip was opened out during the plating operation, it follows that it was plated under a superimposed stress which may have caused failure in hydrogen embrittled areas.

It is probable that clips with sound, nonmartensitic welds, which might be obtained by preheating prior to spot welding, would withstand the zinc plating operation without cracking.

A broken steel cylinder-clamp for a one-hour oxygen breathing apparatus was submitted with the request that a metallurgical examination be made to determine, if possible, the cause of failure. The following cycle of operations was said to have been followed in forming the clamp:

1. The ring was heat treated
2. The ring was shot blasted to remove the scale
3. The ring and the base were copper plated
4. The ring was spot welded to the base
5. The assembly was zinc plated

It was stated that the material of the clamp was carbon spring steel and formerly had been nickel plated without difficulty. When zinc plating was used on the original design which was spot welded in six places a loss of 40 percent was encountered during the plating operation due to breakage. Redesign of the clamps so as to reduce the number of spot welds from six to four was said to have reduced the loss to 10 percent.

The failed clamp, as received, is shown in Fig. 1. It will be noted that the ring shows only slight evidence of change of curvature after the failure. It is evident therefore, that the residual stresses relieved by the failure were of relatively small magnitude.

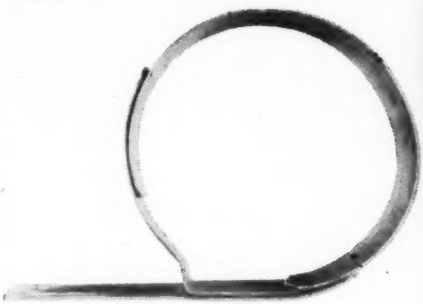


Fig. 1.—Failed spring clip as received. x 1, reduced to x ⅓.

The location of the fracture with respect to the spot welds is shown by the arrows in Fig. 2. The path of the fracture evidently was directed by the location and spacing of the welds since it shows a tendency to follow the edge of the welded areas A and B for considerable distances.

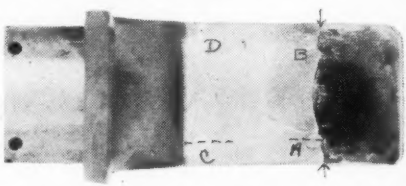
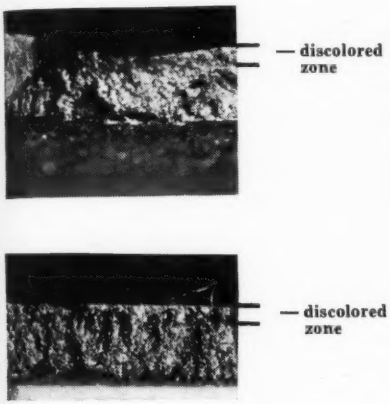


Fig. 2—Base of spring clip with the location of fracture with respect to the spot welds shown by the arrows. The dotted lines show the locations of sections for microscopic examination. x 1, reduced to x ⅓.

The surface of the fracture was discolored to a depth of ¼ to ⅓ of the thickness

across the entire width of the strip. This discoloration was particularly noticeable in the welded areas (Fig. 3) but was easily discernable at considerable distance from the weld (Fig. 4). Except for this dark stain the only differences in texture and appearance of the fractured surfaces were those attributable to the effects of spot welding.



Figs. 3 & 4.—Enlarged view of fracture in area at edge of spot weld showing discolored area along side surface of clip (top of figure) x 10, not reduced. Area remote from weld showing continuation of discolored area. x 10, not reduced.

In structure, the steel in the entire spot weld was found to be martensitic (Fig. 5).

Fig. 5—Longitudinal section through spot weld at fracture showing martensitic structure of weld. Edge of fracture at left and spring steel side of weld at top. The etchant used for this specimen and for those shown in the following figures was a saturated solution of picric acid in alcohol. x 10, reduced to x 5.

The spring steel material, in particular, showed a sharp line of demarcation between martensite in and near the weld, and fine pearlite outside the welded area. A crack near the fracture which is intercrystalline in character for part of its course is shown in Fig. 6. A number of such cracks

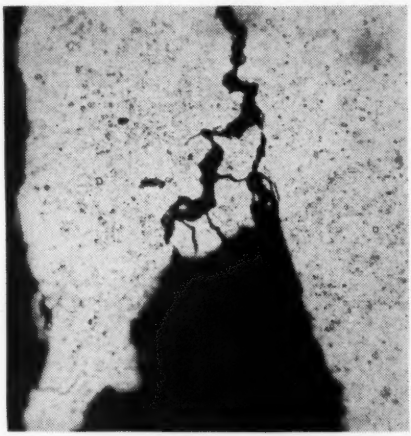


Fig. 6.—Part of crack in weld parallel to fracture showing the intercrystalline character of part of the crack. x 500, reduced to x 250.

was found in and near both of the failed welds. All of them apparently originated in the martensitic areas of the welds but some of them extended for short distances outside the martensitic areas. One of these which was located about .09 inch from the edge of the martensitic zone is shown in Fig. 7. By progressively grinding down the

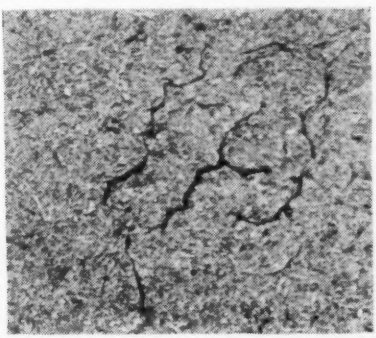


Fig. 7.—Partly intercrystalline crack at a distance of about 0.1 inch from edge of fracture shown in Fig. 6. When ground down to its origin in the martensitic structure of the spot weld, the appearance of this crack was similar to that shown in Fig. 6. x 500, not reduced.

section, the course of this crack was followed to its origin in the martensitic structure of the spot weld where it was similar in appearance to the crack shown in Fig. 6.

Such cracks usually are associated with rupture at high temperatures. It is possible that tiny cracks were formed along old austenitic grain boundaries at a high temperature by the high localized stresses set up during the welding operation.

Similar intercrystalline cracks were found in the unfailed welds C and D of Fig. 2 after they had been stressed by holding the base of the clip in one hand and pressing down on the unbroken part of the clip with the thumb. One of these cracks is shown in Fig. 8. The intercrystalline

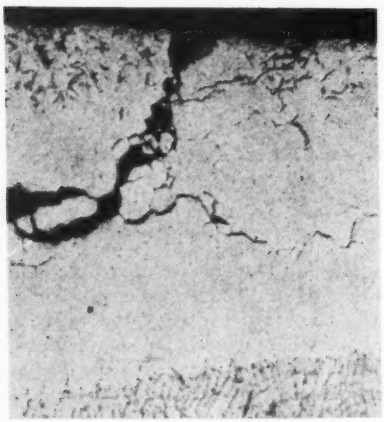


Fig. 8.—Longitudinal section through unfailed weld at C, Fig. 2, with cracks formed by bending, showing intercrystalline character of some of the cracks. x 100, not reduced.

character of some of these cracks as clearly shown in these figures indicates weakness of the material along old austenitic grain boundaries. It is probable that cracks were formed along these boundaries during the welding operation and were present before the part was stressed.

Hardness determinations around the edges of the fused zones in the welds gave Vickers hardness numbers as high as 927. This corresponds to a Brinell number of 699 or a Rockwell C scale number of 65. Steel of such high hardness is extremely brittle and can withstand very little deformation without cracking.

In areas not affected by the heat of welding the spring steel material was not so hard, a Vickers hardness number of 532 being obtained which corresponds to a Brinell number of 486 and a Rockwell C number of 50.

Possible Cause of Failure

The only forming operation mentioned as being different for the zinc plated clips as compared to those previously nickel plated is the plating operation itself. It is assumed, therefore, that all other operations were the same for both types and the effects of sand blasting in producing internal stress and the possibility of hydrogen embrittlement during pickling are ignored.

The most common change in the properties of a base metal that may occur during electroplating is embrittlement. This change is usually attributed to the absorption of quantities of atomic hydrogen by the metal. Some of the absorbed gas may be occluded as molecular hydrogen in rifts, cracks or around inclusions at pressures frequently high enough to cause rupture of the metal. The amount of hydrogen absorbed by the metal and the pressure of the occluded gas depends on the amount liberated on the surface, the current density, time of plating and other factors which vary considerably in different plating baths.

In a sound clean steel a fracture resulting from hydrogen embrittlement is characteristically transcrystalline because occlusion of molecular hydrogen takes place in sub-microscopic rifts opened up along slip planes by stress or by cold working.

The intercrystalline character of portions of the present fracture suggests that occlusion of gas may have occurred in the tiny intercrystalline cracks which have been mentioned earlier in this report as having formed in and near spot welds during the welding operation. Such cracks would serve as pockets for the occlusion of the gas.

Failures due to hydrogen embrittlement usually are characterized by extreme brightness of the fracture in the embrittled areas due to the reducing action of the occluded gas. However, such fractures usually are caused by stress superimposed on material previously embrittled. In the present case the spring clips probably were opened up during the plating operation in order to coat the overlapping parts. It is possible, therefore, that the failed clip was plated under a superimposed stress which was high enough to cause failure in embrittled areas. Progress of the crack across the clip during plating may account for the differential straining of the face of the fracture.

(*Continued on page* 845)

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COMPLETE METAL FINISHING EQUIPMENT

Quality Nickel Deposits Maintained by Continuous Solution Purification

By BERNARD C. CASE

Hanson-Van Winkle-Munning Co., Matawan, New Jersey

EDITOR'S NOTE

The author of this timely article has a wealth of experience with cobalt-nickel baths for which the details of the recommended practices have been worked out. The general philosophy set forth seems to apply also to the more complex straight nickel baths which, however, may require somewhat different procedures to accomplish the same end.

* * *

SINCE the introduction and adoption of bright nickel plating, the plating industry has, because of necessity, directed more and more of its attention and energy to difficulties caused by minute quantities of both metallic and non-metallic contaminants encountered in the operation of nickel baths.

In pre-bright nickel days little thought was given to contaminants as long as they did not materially affect the appearance of the coatings. Today it is recognized that contaminants may cause gray nickel deposits to be produced which have very poor physical properties and inferior ability to protect the base metal from corrosion.

Some of the members of the plating industry tried to maintain this same attitude towards bright nickel deposits when they were first introduced to the trade, that is—cover up the effects of the impurities if possible as long as the deposits were bright. The effects on the unseen physical properties of the deposit were intentionally overlooked or disregarded. A very large share of the criticisms originally made against the operational difficulties of bright nickel processes can today be attributed to specific effects of metallic and non-metallic impurities.

Since the introduction of bright nickel plating processes a large amount of information and experience has been gained, largely by the hard way, about the effects of contaminants on the operation of bright nickel plating solutions, on the bright nickel deposits and on the specifications as to the use of bright or semi-bright nickel deposits.

Purification in the Make-Up of New Solutions

The first indication of the need for a better understanding of contaminating materials and their removal came early in the history of bright nickel processes. The difficulty in building and starting a new bright nickel bath indicated that some foreign materials were introduced along with the necessary ingredients because the deposits were sometimes valueless and hardly ever of as good a quality as could be produced from baths in the laboratory or from solutions that had been in operation. It was not long before it was recognized that it was absolutely essential that any new nickel bath be purified before operation if good deposits from the bath were to be expected at the start. This information explained the old idea that it was necessary to "age" a new nickel bath before it could be used. This so called aging period was the slow removal of contaminants by more or less natural methods. New pitfalls and obstacles were encountered and overcome, such as improperly compounded rubber linings, bad water conditions and improper heating arrangements, but the necessity of purification of the nickel bath proper remained, showing the presence of contaminating substances in the salts and other materials used in preparing the solution.

Satisfactory purification schemes were worked out such as treating the solution with activated materials that removed the organic contaminants, and low current density selective plating out of contaminating metallics. Although it is quite obvious that the proper method to eliminate harmful effects caused by contaminating materials is their removal, many people tried to

overcome the harmful effects caused by foreign substances by increasing certain ingredients in the bright nickel baths that have a tendency to cover up the harmful effects. Even though this was accomplished it sometimes introduced undesirable physical characteristics in the deposits because of high concentration of certain addition agents. The proper use of these two purification treatments showed excellent results in making new nickel baths operate correctly from the start.

Intermittent Purification

Although these treatments constituted a large step in overcoming some of the original complications they did not offer a complete solution of difficulties which developed after the bath had been in operation for some period of time. If the bright nickel bath became contaminated on use, it was necessary to close down production and purify the bath by one or both methods mentioned above. Some installations did not require but very infrequent purifications while others showed need for very frequent treatments. Hollow brass plumbing goods and articles made from steel tubing were two classes of work that early were found to cause very rapid contamination of bright nickel baths. This can be readily understood because of the extreme difficulty in cleaning and removing grease or any organic dirt found on the inside of either the hollow brass or steel parts and the subsequent introduction of the organic contaminants into the nickel solution. Due to their shape it is likewise quite evident that during the electrodeposition of the bright nickel deposit on the outside of the hollow parts the inside might become anodic and dissolve into the nickel solution thereby introducing metallic contaminants.

Although the treatment of the impure bright nickel solution with activated carbon and activated bentonite in a separate storage tank would effectively remove the organic impurities and low current density dummying would plate out the metallic impurities, the frequency of one or both of these purification treatments seriously interfered with production. Along with continuously varying degree of quality due to the varying amount of contaminating materials present in the bath came the operators' attempts to cover up the bad effects by changing either the operating conditions of the bright nickel bath or the amount of the addition agents, which, as explained, sometimes causes serious changes in the physical characteristics of the deposits. The combined effect of these two harmful trends was that nobody could be sure of the quality of the nickel deposits being produced. At the time, many people did not think that this varying degree of quality was of too great importance except where the rate of contamination was very high, as in the case of hollow steel and brass parts. Later experience proved otherwise. It became quite obvious that continuous purification was necessary in the case of hollow metallic articles and it was in these industries that the details were worked out.

Continuous Purification

It was not difficult to move into continuous removal of organic impurities in place of batch treatments with activated carbon and other materials because the necessity for good filtration was realized and supplied for certain bright nickel baths at their very start. By running the filter continuously and keeping a small amount of activated carbon and activated bentonite in the filter at all times and by regular change of the adsorbing materials, the bright nickel bath could be kept practically free of harmful organics regardless of the rate of contamination. Experience soon taught the rate of filtration and the frequency of recharging the adsorbing materials necessary to maintain clean bright nickel plating baths.

The adoption of continuous low current density dummying was the next logical step in the purification of bright nickel baths for plating on hollow brass and steel parts. It was known that complete removal of metallic impurities could be accomplished by intermittent low current density plating but this original method failed to prevent the more or less rapid recontamination of the baths. When the first continuous low current density purification system was installed it was necessary to determine the rate of flow through the purification system and the percentage of the plating current required for purification to keep the bath free from harmful metallic impurities.

The application of these two continuous systems of purification to hollow brass and steel plating installations solved the extremely important problems described.

When applied to bright nickel baths plating on die cast parts they eliminated the mussy and expensive old method of removing dissolved zinc by raising the pH to accomplish precipitation.

While the value of continuous purification was being proved in industry, one of the large automobile manufacturing corporations began to find considerable inconsistencies in service performance and in salt spray tests of various bright nickel deposits. Test panels produced in laboratory solutions and under close control would give satisfactory results, but when baths were installed for production work, the quality of production plate did not necessarily reach that obtained with laboratory test panels. Also, different results were obtained on parts plated by different people running the same type of bath.

This situation, when investigated, proved the fallacy of attempting to cover up the effects of contaminating materials on bright nickel deposits. It likewise proved the need of continuously purifying bright nickel baths so that there was no need of deviating from the recommended concentrations of the addition agents. This investigation likewise disproved the statement: "if you can't see the effect of an impurity it isn't going to hurt anything."

The next step in this investigation was to set up a bright nickel plating installation that would remove the harmful metallic and non-metallic impurities continuously. It provided bright nickel deposits of a constant and reproducible quality and showed that test panel quality of bright nickel deposits can be obtained in any sized production plating bath on any base metal. Without a doubt this large step forward in the operation of bright nickel plating baths will result in less trouble, lower cost of operation and consistent production of the highest quality deposits. Sooner or later the continuous purification principle will be applied to other types of plating baths.

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Louis Weisberg, Metal Finishing, June, 1941.

DIPLOMAS TO APPRENTICES

(*Continued from page* 777)

in the world. These certificates, as you know, have been issued by the Federal Committee on Apprenticeship Certificate of Completion.

"I am especially gratified to present them because this event marks a milestone in your industry. You are the first apprentices in the courses approved by the Federal Committee on Apprenticeship Standards of the War Manpower Commission for this area and thus, you are local pioneers in these apprenticeships."

Dr. Blum was then introduced and talked to the graduates about the future of the industry of which they are now journeymen and advised them to study the scientific aspects of electroplating that they may understand the reasons for the methods and processes that are used in their daily work.

Also at this same concern which acquired two journeymen with the graduation is the oldest apprentice indentured in any of the trades having approved apprentice training courses under the Federal Committee in the District of Columbia. Only recently indentured, Albert A. Sweeney will observe his sixtieth birthday next Christmas Eve. He has already served apprenticeships in two other crafts but feeling that indoor occupations are advisable for older workers, he has entered upon an indenture for electroplating.

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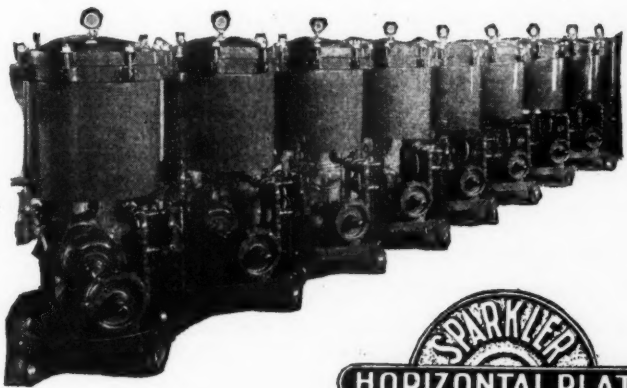

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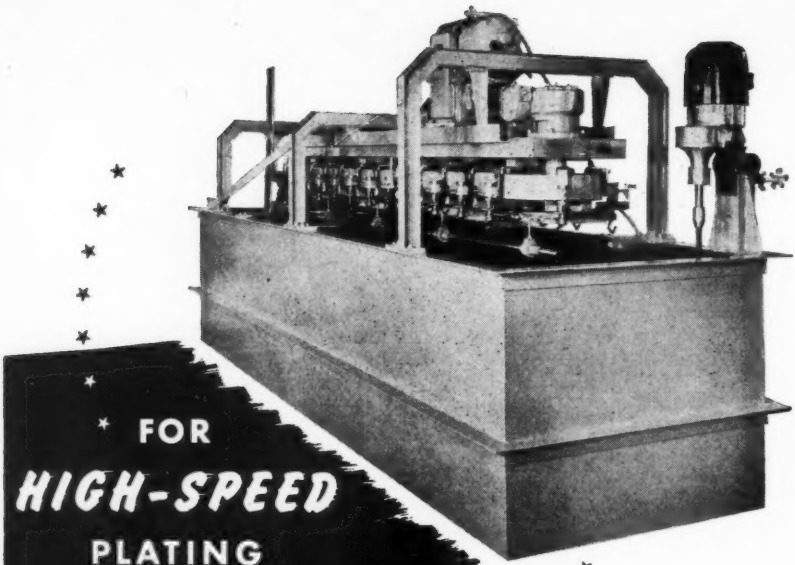

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STAND-BY D. C. BATTERY SYSTEM FOR SILVER PLATING

By D. L. PATRICK

Introduction

TO secure a dense, uniform, coherent, thick electrodeposit of silver, a continuous flow of direct current must be maintained during the time period required to produce a predetermined thickness. If the current flow is interrupted and then resumed, a laminated silver deposit is produced. Such laminated layers in a thick deposit of silver, such as required for aircraft bearings, are cause for rejections.

The frequency of current interruptions during plating is irregular. They may be caused by overloaded power circuits, electrical storms, short circuits and mechanical difficulties. These are costly and involve losses of production time and critical material. While power failures may not endure for a long time interval, they may still be of a sufficient duration to cause lamination upon resumption of plating.

To insure against such current interruptions, a stand-by D. C. battery system has been devised that can be installed in conjunction with silver plating equipment and electrical circuits.

The cost of a stand-by D. C. battery system may well be sustained by the cost of lost production with one such power failure.

Installation

Merely floating a battery across a D. C. bus or plating circuit is impractical and not recommended. The complications involved in the close operating range and crossing voltages of a D. C. rectifier or D. C. generator circuit and a D. C. battery would always maintain the battery in a discharged condition. An automatic mechanical electrical hook-up has been devised which overcomes these complications.

The system was designed for operation on a normal 6 volt D. C. plating circuit when the A. C. current source fails. Additional batteries may be connected or installed in the battery bank to provide a higher current capacity if it is desirable to continue the plating operation at the normal operating current density, without loss of plating time.

The stand-by D. C. battery system is shown in the diagram and employs the following items:

1. Two 8 volt batteries are used, each capable of delivering approximately 240 amperes discharge for twenty minutes before the terminal voltage falls below 6.4 volts. The battery voltage is somewhat in excess to that demanded by the D. C. plating circuit, but will provide for a normal loss in capacity that may occur after the battery has been in service.

2. One battery is used as a stand-by unit while the other is being serviced. Additional batteries may be paralleled in the same line if additional current capacity is desired at the same voltage. The same number of batteries are maintained in each bank whether in the stand-by unit or the servicing unit.

Servicing consists of watering the batteries and giving them a slight boosting charge to compensate for self discharge losses. Each battery or bank of batteries should be allowed to remain in the line no longer than one week regardless of whether it was called upon for discharge or not.

If at any time a battery or bank of batteries is discharged by an A.C. power failure, it should be replaced by the stand-by battery unit or bank of batteries when normal power is resumed and immediately serviced and fully charged.

3. The battery or bank of batteries is connected in parallel with the D.C. bus with a 150 ampere 2 pole magnetic contactor (C) with its 6 volt holding coil between the battery and the D.C. bus line. The contactor is of the normally open type. If batteries are added to the circuit, a separate contactor and holding coil should be installed for each battery.

4. The 6 volt holding coil is connected in parallel to the battery (to each battery if more than one is used) through a single pole magnetic contactor (B) with its 220 volt holding coil. The contactor is of the normally closed type but stays open until the A.C. power fails.

5. The 220 volt holding coil is connected across the 220 volt line to the rectifier or generator D.C. source.

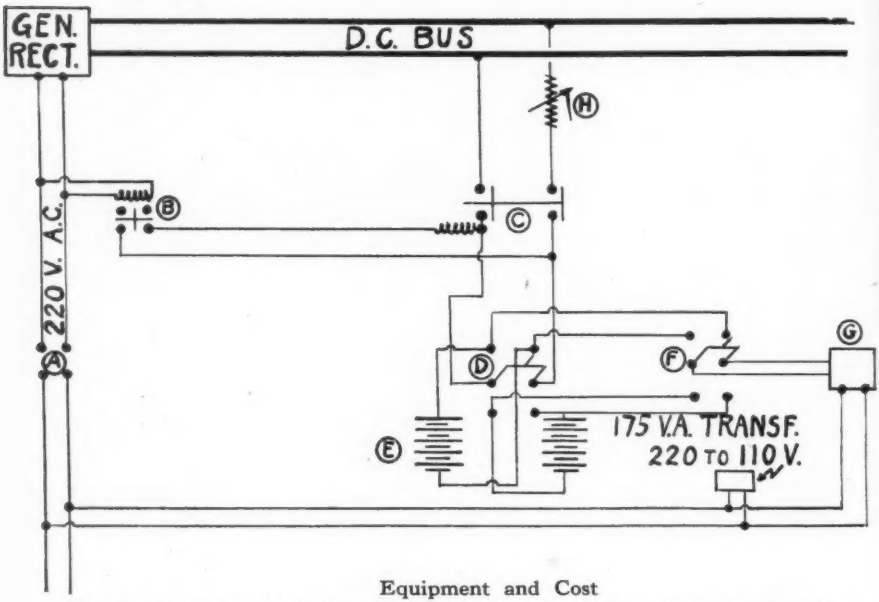
6. A double pole, double throw reversing switch (D) is placed in the line between the D.C. bus line and the batteries or banks of batteries to facilitate changes from the standby to the service unit when the former needs servicing or charging. Either battery unit may be charged from battery charger (G) by throwing switch (F) to either unit line.

7. To reduce drain on the D.C. battery current source a limiting resistor (H) of desired resistance is placed in the line between the battery, or bank of batteries and the D.C. bus, ahead of the D.C. 6 volt contactor.

Operation

In operation, the system performs as follows: When the A.C. power to the rectifier

(*Continued on page* 810)



Equipment and Cost

All electrical items involved in the system described are standard commercial items of leading electrical equipment manufacturers, except for the battery. However, a few battery manufacturers may stock a standard 8 volt battery. (Approximate total cost of equipment for the installation described was $275.00 and consisted of the following:

A. 220 Volt A.C. Line Switch.

B. Single pole, A.C. normally closed magnetic contactor with 220 volt A.C. holding coil. Allen-Bradley Bulletin 702, Size O.

C. Double pole, D.C. normally open magnetic contactor with 6 volt D.C. holding coil, 150 amps. capacity, Allen-Bradley Bulletin #203, enclosed type for 2 wire pilot control.

D. Double pole, double throw reversing switch, 200 amps. capacity, General Electric.

E. Delco Remy Battery, Special, 8 volt, 240 amperes/20 minute drain.

F. Double pole, double throw reversing switch, 30 amps. capacity, General Electric.

G. Mallory battery charger type #107, 125 watts, 50-60 cycle, 115 volts A.C., 7 to 10 amperes output.

H. Allen-Bradley carbon compression resistor #5, 375 watts max., switchboard mounting.

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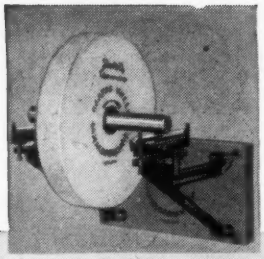
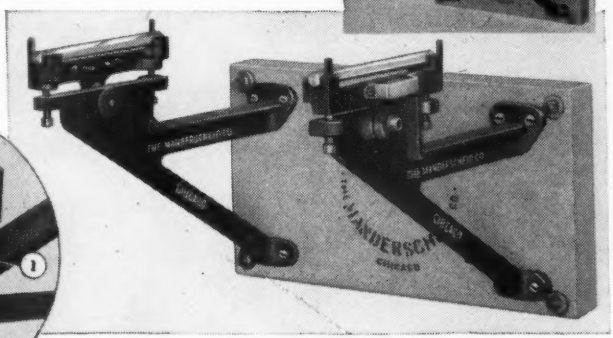


1. Screws for leveling WAY
2. Spirit level attached to WAY
3. Edge, ground and honed



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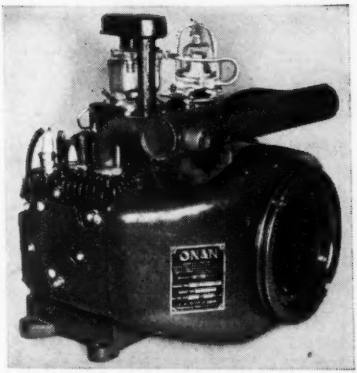

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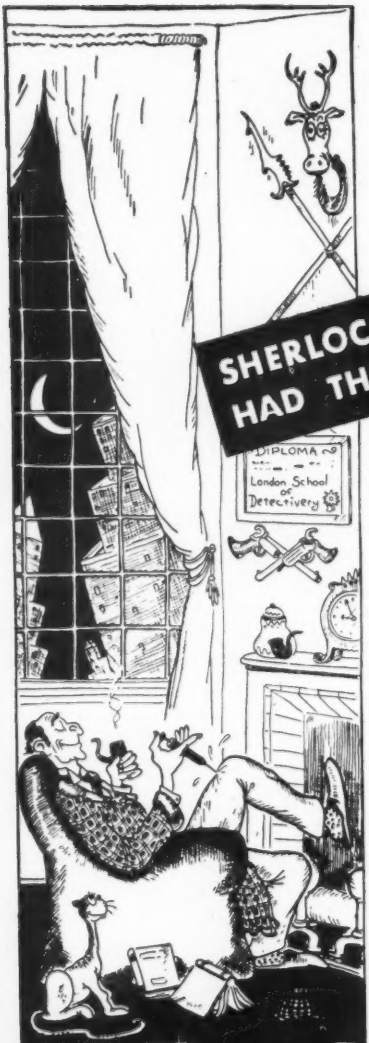

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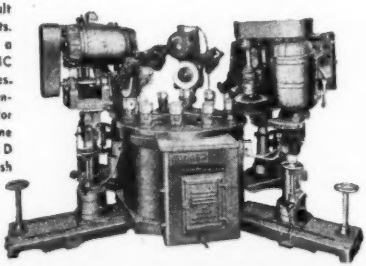

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RESEARCH COMMITTEE MEETING

By A. KENNETH GRAHAM
Executive Secretary

THE Research Committee held a meeting at the Statler Hotel, Buffalo, N. Y., Saturday, July 14, 1945 at 10 P.M.

Mr. C. E. Heussner was unanimously reelected as Chairman of the Research Committee for the ensuing year.

Mr. C. E. Heussner suggested that during the coming year at least one or two more projects be undertaken by the Committee. He also suggested that a Finance Committee be created and entrusted with the responsibility of raising funds for the Research Committee.

The following motion was passed: "The Chairman be empowered to appoint a chairman of a Research Finance Sub-Committee to solicit sustaining members and contributions from persons, branches, and organizations." The Chair appointed M. R. Caldwell Chairman of the Research Finance Sub-Committee with power to appoint his own committee.

After A. K. Graham had indicated his inability to continue to serve as Chairman of the Research Directing Sub-Committee, the Chair appointed Dr. R. M. Wick to serve as chairman of this committee with power to appoint the members of his committee for the year 1945-46.

Considerable discussion was devoted to the importance of having the local Branches give due credit to the contributions for the Research Fund by local concerns.

It was further agreed that the local Branches should be asked to list contributors in their area when publishing their local bulletin.

Since sustaining members are those contributing $100.00 or more annually, to the Society Research Fund, it was agreed that letters should be sent to the contributors advising them of their status as Sustaining Members.

As a means of increasing the demand for publications of the A.E.S. and as a means of supplying a ready source of photostatic copies of articles appearing in both the *Review* and the Proceedings, the Secretary suggested that an effort be made to arrange for complete sets of these publications in public libraries. Then requests for reports or photostatic copies received by the Secretary, can be referred to these libraries.

The Chair requested Dr. Wick to report at the Fall meeting on the availability of facilities and personnel for new projects.

The Secretary was instructed to write C. A. Sample advising him of our desire to have him continue as laiason for the A.S.T.M. Committee B-8. Dr. William Blum was appointed laiason of the A.E.S. Research Committee to Committee B-8 of A.S.T.M.

The resolution of the Philadelphia Branch with respect to courses in electroplating in the public schools was discussed in detail and referred to Dr. William Blum who was asked to incorporate the suggestions of the committee in a report for the next meeting.

A prolonged discussion ensued around the protection of interests of owners of patents or proprietary compounds who had furnished information for our projects and whose interests might be adversely affected through publication of our experimental results.

The following motion was passed: "Any patents resulting from researches under the auspices of the Research Committee shall be made available to the public at no cost." "As a policy, projects of the A.E.S. Research Committee shall be confined to materials or information that are obtained or released without restrictions for use by the Committee; or information obtained or de-

(*Continued on page* 845)

Our 1945-46 Slogan—

400 New Sustaining Members This Year!

AT the Annual Business Meeting at Pittsburgh the delegates voted in favor of the Amendment to the Constitution as proposed by the Newark Branch. This Amendment has been published in the *Review* as required by the Constitution.

The Amendment has many advantages—the most important of which is that through the sustaining membership arrangement we now have a method of procuring funds for the Research Program. As all members now know Sustaining Membership is obtained by contribution of at least $100.00 annually to the Research Fund which is used for investigation of problems and processes directly related to electroplating, or any of its allied arts. We hope this prime purpose of the Amendment will permit the Research Committee to devote the most of its time to organization and planning of research on these problems, rather than to procurement of funds as in the past.

At the Research Committee meeting held in Buffalo, July 14, and at which Carl Heussner was re-elected Chairman, the subject of Sustaining Members was discussed. A vigorous campaign was planned for enlisting a substantial number of new members in this class. As newly appointed Chairman of a Finance Sub-Committee designated to handle the financing for the ensuing year I will take this opportunity to briefly outline the general plan, as we now see it, so that all concerned within the Branches will be able to assist as the drive develops a little later on.

Since the Research Committee has quite definite plans as to the cost of operation for the coming years, we feel that it is necessary to have a minimum of 400 Sustaining Members in order to keep the contemplated program in operation. A letter will be sent to each Branch in the near future designating the number of Sustaining Members to be obtained in its locality. This quota will be based on the number of members in each Branch.

Properly presented, Sustaining Membership should be relatively easy to promote. As you know several very useful papers have appeared and are continuing in the *Review*. This definite and very tangible evidence of resultful progress should be detailed to those you would interest in our Research Program.

Further, due and proper recognition for active support of the Research Fund will be made by annual publication in the *Review* of the list of Sustaining Members. First publication of this honor roll will be in the September issue.

Support of our expanding and effective Research Program is not limited to Sustaining Members alone. At this time, mention should be made of the remarkable support many of the Branches have given in financing the Research Program to date. For example, many Branches are now on a basis whereby dues have been raised approximately $1.00 per year and the increase turned over to the Research Fund. During the coming year, we wish to promote this further and I believe you will agree with me that we should. In fact, we see no reason why a majority of the Branches should not desire to assist by turning over a definite sum per member of the Fund. Please give this further thoughtful consideration when it is discussed at Branch meetings.

Since it will be necessary for various members of the Research Committee to contact the Branches during the coming year, we would appreciate receiving the name and address of each Branch Research Chairman. While our list from last year is fairly complete the appointments for the coming year should be reported promptly by the Branch secretaries to Carl Heussner, Research Chairman, % Chrysler Corp., Detroit 31, Michigan.

In closing, remember our slogan "400 Sustaining Members for the Coming Year." Let us put forth every effort to obtain this number of Sustaining Members.

MAURICE R. CALDWELL, *Past President*

Progress Report Number Two:

A.E.S. Research Project Number 2 on "ANALYSIS OF IMPURITIES IN PLATING BATHS"

Project Director: G. Frederic Smith
University of Illinois, Urbana, Ill.

Associate: Frederick Duke
Princeton University, Princeton, N. J.

SINCE the publication of the bibliography[22] on the analysis of nickel plating baths, a number of laboratories have reported to the committee the methods they now use; the published literature has been gone over carefully; and methods have been discussed in conferences with Project Sub-Committee No. 2. The present report is a critical digest of the methods now known and used.

The Committee wishes to gratefully acknowledge receipt of methods from the following laboratories: The Udylite Corp.; Hanson-Van Winkle-Munning Co.; Standard Steel Spring Co.; Harshaw Chemical Co.; Chrysler Corp.; McGean Chemical Co.; the International Nickel Co. and Foster D. Snell, Inc.

General

Although gravimetric and volumetric methods are superior to colorimetric methods in accuracy and general usefulness on the macro scale, the relative positions of the types of analysis are reversed in trace work. For example, in 100 ml. containing 100 p.p.m., only 10 mg. of the substance would be obtained in the precipitate. In any case, colorimetric methods are faster, usually more specific, and can be followed with equal ease and without expensive equipment. (A filter photometer costs about $150.). For these reasons gravimetric and volumetric methods cannot compete with colorimetric analysis unless good color reactions for the substance sought are unavailable. Project Sub-Committee No. 2 is convinced that photometers will become as widely used in the plating industry as are pH meters. They are no more difficult to operate than the latter.

Recent literature contains much good material on colorimetric methods for the common metals, and many such methods are in use at present, as evidenced from the material provided for the Committee by the industry. Therefore, the following discussion will confine itself to colorimetric methods except in those cases where there is a reasonably closely competing gravimetric or volumetric one.

Aluminum

There are a number of good colorimetric reagents for aluminum,[20] no one of which is known to be very much superior to the others. However, a urin tricarboxylic acid or its ammonium salt (aluminon) has been the most thoroughly tested and makes possible the determination of less than one part per million of aluminum in the presence of relatively large amounts of other substances.[18] The reagent is sometimes used in slightly acid, and sometimes in slightly alkaline solution; of the two, the former is to be preferred because the color is more stable, interference from substances likely to precipitate at the higher pH tends to be less, and the conditions are not as critical.[18]

Before the method can be used, a separation must be made from certain interferences, chiefly iron and colored substances.[20] A partial separation can be accomplished by precipitation of hydrated alumina, although iron, lead, chromium, manganese and silica are or may be precipitated with the alumina.[20] A complete separation can be made by use of the mercury cathode,[15] the aluminum remaining in solution; this method is undoubtedly the best, although it is quite time-consuming (3-4 hours).

Cadmium

The best colorimetric reagent for cadmium is dithizone (diphenylthiocarbazone).[7] When this reagent is dissolved in carbontetrachloride or chloroform and shaken with a cadmium solution one normal in sodium hydroxide, an orange-red color is produced. Less than .005 mg. of cadmium are determinable. Cobalt, nickel, copper, silver, and mercury interfere.[7] Cadmium is also determinable by the depth of the yellow color of a suspension of cadmium sulfide. The comparison of the unknown to the standards must be made in ultra-violet light for high accuracy and many metals interfere.[6]

The separation of cadmium from large amounts of nickel is probably best done by sulfide precipitation in slightly acid solution (pH 3)[6]. Very little work on this point has been reported.

Calcium

There is no good colorimetric method for calcium which does not involve a prior precipitation. Therefore, gravimetric and volumetric methods are not out of the question, and in fact may prove most useful.

Calcium may be precipitated as the oxalate,[21] picrolonate,[1] phosphate,[17] or potassium nitrito nickelate[16] among others. Then the precipitate is dissolved and the anion determined colorimetrically. The most rapid of these and the least subject to interference is the oxalate precipitation.[14] The determination is subsequently carried out based on the fact that oxalate, a reducing agent, will decolorize a strong oxidant such as ceric sulfate.[1] It should be possible to use the same reaction volumetrically on small amounts of calcium oxalate without too great a loss in accuracy.

Centrifugal methods are often very useful and rapid in a case of this kind where the determination is based on precipitation. The precipitate is made to settle into a small graduated tip of a centrifuge tube and its volume is measured.[23]

Chromic Acid

The yellow color of chromate ion provides a colorimetric method for chromic acid.[12] However, the method is rather insensitive and is subject to serious interference by other colored substances.[12] A more specific and sensitive method is that based upon the color formed when chromic acid reacts with s-diphenyl carbazide.[19] The violet color produced allows the determinations to be accurately done in the presence of large amounts of metals such as nickel.[10] This method is now in use in the plating industry.

The oxidation of chromic ion to chromic acid (necessary for total chromium determination) can be done in acid solution by use of persulfate and silver ion,[13] by bromate[13] or by permanganate.[13] All except the latter oxidize manganese to permanganate which must be removed before color development with diphenyl carbazide. Therefore, permanganate would seem to be the best oxidant, the excess being removed with chloride ion, which permanganate will oxidize under conditions not affecting chromic acid.

Copper

There are many colorimetric methods for copper,[20] the best two of which are the dithizone[3] and the diethyl dithiocarbamate[5] methods. The former can be made to operate directly on the nickel baths without interference, while the latter requires the separation of the copper from nickel, cobalt and manganese. The dithizone method is the more sensitive of the two, and would appear to be much the easier to use on nickel baths. The only preparation necessary for the dithizone method is the addition of hydrochloric acid to the nickel solution. Then a straight extraction removes only copper, since silver, mercury, gold, palladium and large amounts of bismuth are not encountered in the baths; these metals are the only interferences.[3]

Iron

More colorimetric methods exist for iron than for any other element.[20] However, two of the many methods stand out as better than the others for the problem concerned; these are the thiocyanate[11] and the o-phenanthroline methods.[9, 23] Both of these methods are useful in acid solution and are very sensitive.

The thiocyanate method can be used directly in the nickel bath[11] and is in use at present in the industry. It suffers from the disadvantages that the color is unstable[20] and that the depth of color is dependent upon the type of bath. The addition of

acetone tends to stabilize the color, but cobalt tends to interfere under these conditions.[20]

The o-phenanthroline method requires the separation of the iron from nickel. However, this can easily be accomplished by the extraction of the cupferride.[20] The color is stable for long periods of time (6 months), and the color from all baths is identical with a given amount of iron.

Lead

The dithizone[2] method for isolating and determining lead is doubtless the best and can be applied directly to nickel baths without separations. The method is very sensitive and so requires the use of lead-free reagents. At a pH of 8.5-10 in the presence of cyanide and tartrate, only lead, bismuth, thallium and stannous tin are extracted by a carbontetrachloride solution of dithizone.[20] The lead dithizonate is red, whereas the dithizone is green. The excess dithizone can be removed from the organic layer by shaking with a weakly alkaline aqueous solution. The determination is finished by measuring the depth of the red color.

Manganese

Periodate in a strongly acidic solution oxidizes manganese to strongly colored MnO_4^-.[25] The depth of the purple color is a measure of the manganese present. Nothing in the nickel baths interferes after organic matter and chloride have been removed by treatment with sulfuric and perchloric acids.

Silica

Silicate in acid solution forms highly-colored yellow silicomolybdate upon the addition of molybdate.[24] The test is more sensitive if a reducing agent is used to produce molybdenum blue from the heteropoly acid; silicomolybdate is more easily reduced than molybdate.[24]

Colloidal silica fails to react with molybdate and in general must be fused in a metal crucible with Na_2CO_3 to put it in solution, before applying the method above.[24]

Zinc

There is only one type of colorimetric reagent for zinc—dithizone and its homologues.[20] There is more than one way in which dithizone can be applied to the problem, however. One method involves the use of cyanide and thiosulfate to prevent metals other than zinc from reacting, but the pH at which the method is used (5.5) is unfavorable for the extraction of zinc, and the procedure contains several critical operations.[8] Another method employs diethyldithiocarbamate at a pH of 8.5 to retain interferences, but only small amounts of other heavy metals may be present in this procedure.[4] A third method uses α-naphthylthiocarbazone in the presence of cyanide and diethyldithiocarbamate at a pH of 8.5 (McGean Chemical Co.). The third procedure would appear to be the easiest to use.

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(*Continued on page* 810)

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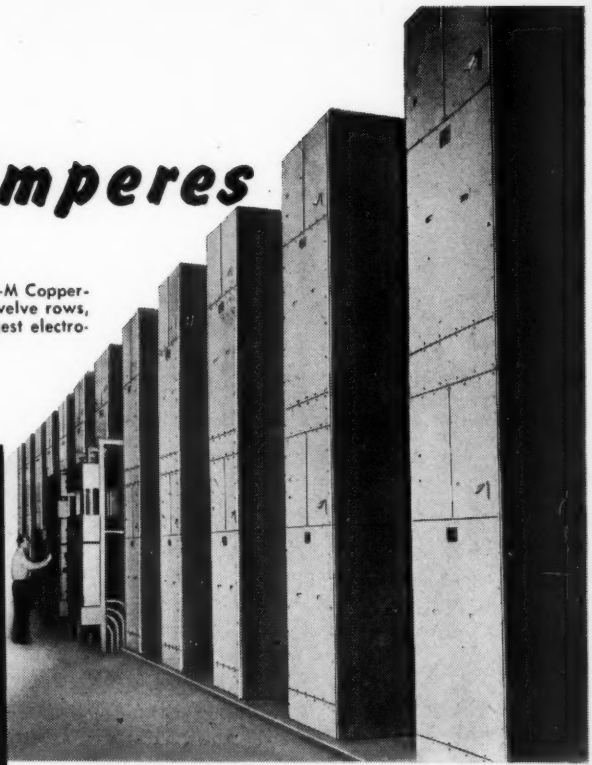

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RESEARCH PROJECT #2

(*Continued from page* 807)

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STANDBY D. C. BATTERY SYSTEM FOR SILVER PLATING

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or generator fails, the 220 volt holding coil releases contactor (B) to close the D.C. holding coil circuit thereby energizing the coil, closing contactor (C). This throws the stand-by D.C. battery onto the D.C. bus line.

Resumption of current in the A.C. line energizes the 220 volt coil and opens contactor (B), thereby de-energizing the 6 volt coil and opening contactor (C), breaking the battery connection to the bus.

The A.C. contactor will open, closing the D.C. battery circuit, when the 220 volt A.C. drops to 198 volts or a 10 percent drop of the A.C. line voltage. The allotted time interval for the complete change-over from the normal D.C. source to the stand-by D.C. battery is approximately 6 cycles or one tenth of a second.

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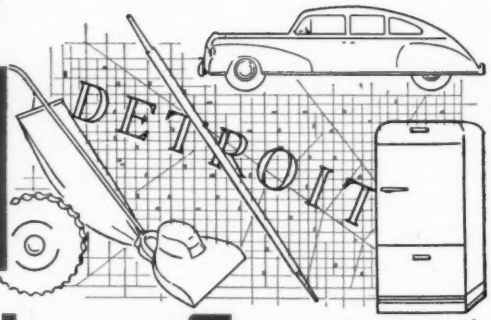

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INDUSTRY NEWS

Loengard Heads United Chromium

Announcement is made of the appointment of Mr. Richard O. Loengard as President of United Chromium, Incorp. and Messrs. Theodore G. Coyle and Hugh D. McLeese as Vice-Presidents. All three men, well known in the electroplating and metal finishing field, have been associated with the company since its inception. Messrs. Coyle and McLeese will continue as Technical Director and General Sales Manager, respectively.

Mr. Kevie W. Schwartz who has resigned as Vice-President, will continue to make his services available to the company as a consultant on patent matters.

The opening of district offices by United Chromium in Chicago and Dayton has recently been announced and plans are being made for a new office on the Pacific Coast. In addition to the laboratories and offices maintained at Detroit, Mich., and Waterbury, Conn., a new plant is now being equipped at Carteret, N. J., for the manufacture and development of the company's products.

Pamphlet Details Kelvin Bridge Method for Measuring Surface Resistance of Sheet Aluminum

Engineers concerned with spot welding of aluminum will find much interest in a recently issued 3-page pamphlet that describes a method for improving control over cleaning and deoxidation of aluminum stock preliminary to spot welding. Complete construction and circuit details of the instrument are given. Address request to Clepo Laboratory, Fred Gumm Chemical Co., Inc., 538 Forrest St., Kearny, N. J. Ask for pamphlet MR-81.

Charles W. Yerger Retires from H-VW-M

Charles W. Yerger, for a number of years Vice-President in charge of Sales for the Hanson-Van Winkle-Munning Co., of Matawan, N. J., and more recently Executive Vice-President, has retired from the Company.

Mr. Yerger's ability and warm personality gained him the respect and affection of all his associates in the H-VW-M Company. He leaves with all their good wishes.

Technical Service Representatives

Men under 45 years of age with previous sales or service experience and knowledge of manufacturing operations or mechanically inclined. Several established territories including some in mid-western location. Men must be able to relocate. Car essential. Trained in New York at our expense to qualify in use and servicing of our cleaning, drawing, stamping, cutting and rust-proofing materials. Excellent opportunity for right men now and in post-war period as our organization sells to and serves practically every type of industry. Attractive compensation arrangement. Give full details of age, experience, etc. Replies treated confidentially. MR-8A.

Electroplating Man

Man with good personality inclined toward sales who has had experience in metal shaping, forming or finishing field preferably with heavy experience in electroplating. For problem work with service representatives of manufacturer of materials having wide use in entire industrial field. Excellent post-war opportunity. Location New York City, some traveling. Give details age, experience, salary desired. If qualifications are of interest, interview will be arranged at our expense. Box 567, Church St. Annex, N. Y. P.O.

Plater Wanted

All around man for job shop with special experience in hard chrome to head up department. Desirable permanent position with satisfactory arrangements for right man. Agreeable working conditions. Address MR-8B, *Monthly Review*, P.O. Box 168, Jenkintown, Pa.

Silver Plater Wanted

For repair work, hollowware, etc., to head up department. Permanent. Satisfactory arrangements right man. Agreeable working conditions. Location New York State. Address MR-8C, *Monthly Review*, P.O. Box 168, Jenkintown, Pa.

Engineer Wanted

For established production plating shop in Northern Ohio. Job covers production methods, plant layout, design of plating racks, design of jigs and fixtures for automatic polishing. Write giving full details and salary expected. Address MR-8E — *Monthly Review*, P.O. Box 168 Jenkintown, Pa.

New Carbon Remover Introduced

Shops replating such items as used engine parts, either ferrous or non-ferrous, will be considerably interested in "CARBO-BLITZ," a new type of carbon remover. The maker, Phillips Chemical Co., claims the product operates safely and efficiently at from 5-10 times the speed of ordinary carbon removers without need for scraping or wire brushing and the attendant danger of injury to surfaces. The product used cold in any container is further said to be non-flammable, non-toxic, and non-injurious to the worker and can be safely used for all types of metals and alloys. Complete details on "CARBO-BLITZ" furnished on request to Phillips Chemical Co., 3465 — 30 Touhy Ave., Chicago 45, Ill.

New Company Offers Metal Finishes and Research Services

Recently organized under the name Technic, Inc., this firm reports it is staffed by a group which for years produced and serviced an outstanding line of metal finishes and services.

Products included: Trushade 24K Soluble Gold (aqueous), White Brass, Antique Smuts, Black Finishes for Brass, Copper and Silver, Soluble Hard Gold Alloy (aqueous), 14K Soluble Gold Alloy (aqueous), Flame Flux, Wetting Agents, Pink Soluble Gold Alloys, Soluble Green Gold Alloy, Immersion Tin, Gold Strip, Aluminum Preplate, and Protextox (invisible oxide).

The complete metal finishing services offered include consulting, analytical, research, engineering, and testing work as well as plating room design. Complete information on products or services is available direct from Technic, Inc., 39 Snow Street, Providence, R. I.

Second "E" Star for Lea Mfg. Co.

The LEA Manufacturing Co., Waterbury, Conn., specialists in methods and compositions for burring, polishing and buffing, has been awarded its second Army-Navy "E" Star for "maintaining a fine record of production."

J. C. Baker to Rheem Research Products

Rheem Research Products, Inc., Baltimore, has appointed Mr. J. C. Baker to represent the company and its product, Iridite, in the eastern Ohio-western Pennsylvania-West Virginia territory. Jess Baker was formerly associated with the Black Industries, Cleveland, as Production Controller and Director of Purchases, and is widely known to industrial executives throughout the territory.

News of Job Platers

According to a report from the Masters' Electroplating Association, 123 William St., New York, N. Y., the job plating industry has been very busy during the past year. Despite cutbacks and cancellations in war materials, job plating operations have continued at practically the capacity of plants and labor force obtainable with shortage of skilled help now the greatest problem of the job shops.

Job platers from New York, Boston, Philadelphia, Cincinnati, Detroit, Chicago and Los Angeles were active in helping the OPA to set up a practical, workable regulation MPR 581, calling for ceiling prices, or methods of calculating these for the industry. Tying in closely with operation under this new regulation, the Association will continue to study and educate its members in the practice of estimating and cost finding.

At the 32nd Annual Conference of the A.E.S. in June, 1944 a meeting of job platers, with E. J. Musick of St. Louis, Mo., Chairman, was attended by over 75 men from all over the U. S. Plans were laid to make this meeting an annual affair which in time may result in formation of a national association of job platers. Chairman for the next meeting will be R. J. O'Connor of Bridgeport, Conn.

The Plating Institute of Detroit, 2236 Dime Building, is a very energetic and useful organization, under the guidance of R. M. Shock, Executive Secretary.

A new and active group of job platers has been formed in Massachusetts: The Master Metal Finishers' Association of New England, Inc., with Walter R. Guild as Managing Director.

Nelson Todd Returns to H-VW-M

His many friends in the Company and the electroplating industry will be pleased to know that Nelson Todd has rejoined the Hanson-Van Winkle-Munning Co., of Matawan, N. J., as Assistant to the President. He has been re-elected a Director in the Company.

New Building for the Chemical Corporation

This company has just announced purchase of a building at 54 Waltham Avenue, Springfield, Mass., containing approximately 48,000 square feet. There are six floors which make it ideally suited for warehousing and manufacturing purposes.

Optimus Introduces Aluminum Pre-Cleaner and Deoxidizers

The Optimus Detergents Company, 130 Church Street, Matawan, N. J., manufacturers of industrial metal parts cleaners, announces the introduction of OPTIMUS Aluminum Pre-Cleaner and Deoxidizers for producing low surface resistance on aluminum preparatory to spot welding. Among the advantages claimed are: a smut-free surface, oxide removed using a cold solution, negligible weight loss, minimum machine adjustment and handling. Complete, easy removal of shop dirt, cutting oil, grease and identification paint is obtained by the pre-cleaning operation. In addition, the aluminum is placed in condition for Alrok treatment, anodizing and painting. With the use of the proper method all classes of alloys are easily handled.

Mathieson Expands Dry Ice Plant

The completion of a $400,000 addition to Mathieson's Saltville carbon dioxide plant is announced by George W. Dolan, President of the Mathieson Alkali Works. This expansion provides an increase of over 50 per cent in the amount of dry ice and carbonic gas available to users throughout the South and Southwest. Provision for distributing the increased output to warehouses in 15 cities has been made by the addition of 30 new dry ice cars to the Mathieson fleet.

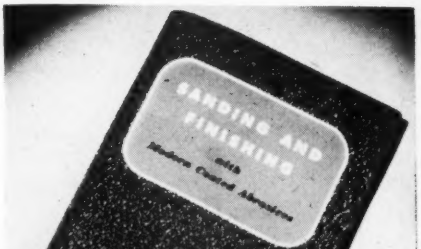
KW - Clean Bright Brass Cleaner

Cowles Detergent Company, Cleveland 3, Ohio announces the latest development of their Research Department — Cowles KW — Clean Bright Brass Cleaner. This product is a high speed, efficient, free rinsing brass cleaner. It can be used in still tank with or without electric current and in washing machine equipment. KW cleans bright and does not attack or tarnish the metal, also adaptable to cleaning die-castings. Full information on request.

Frank E. Murphy Appointed Director of Development Division of Penn Salt

Mr. Frank E. Murphy, formerly Assistant to Manager of Research and Development Department, has been appointed Director of Development Division, Research and Development Department, Pennsylvania Salt Manufacturing Company, Philadelphia, Pa., according to recent announcement by Dr. S. C. Ogburn, Jr., Manager. In his new position Mr. Murphy will have charge of chemical engineering activities including pilot plant operations, engineering research and related fields of work. He will be located at Whitemarsh Research Laboratories though a substantial amount of the work involved will be carried out at various plants of the Company.

Free 84-Page Book on Sanding and Finishing



To acquaint coated abrasive users with the newly announced system for identifying coated abrasives by "CARBORUNDUM," the Carborundum Company has prepared "SANDING AND FINISHING," an 84-page book containing information about coated abrasives, including a complete explanation of the new system and new *End Use* names for all coated abrasive products. Also there are comprehensive recommendations for the use of coated abrasive products in metalworking, woodworking, shoe and leather, floorsanding, printing, plastics, pipe and hat trades, specifications for belt sanding, belt splices and speeds.

"SANDING AND FINISHING" is available to all bonafide industrial users of coated abrasives. Requests must be on business or company letterhead and addressed to the Carborundum Company, Niagara Falls, N. Y.

William E. Flint Joins Sales Staff of the Chemical Corporation

The Chemical Corporation, Springfield, Mass., has appointed Mr. William E. Flint as salesman handling industrial chemicals. Mr. Flint was formerly chemist at the American Hardware Company, New Britain, Conn.

Electropolishing Demonstration Units Available To Fabricators of Stainless Steels

In a move to assist fabricators of stainless steels to prepare for production of civilian goods, the Rustless Iron and Steel Corporation has announced it is making available at once, without cost, electropolishing demonstration units using the Rustless patented process.

Purposes of loaning these units is to assist interested fabricators in evaluating a practical and proven electropolishing process in their own plants, that is particularly applicable to the finishing of complex formed and welded wire products and other small items difficult to finish mechanically.

The demonstration unit is a lead-lined tank of treated wood with inside dimensions 6 by 12 inches. It has two cathode bars and one anode bar. and the item to be electropolished is attached to the anode bar. Included are a relay for temperature control of the bath, a temperature regulator, an ammeter, and a heater. Components of the solution, which is restricted to the electropolishing of stainless steels, are 15-20 percent sulphuric acid, 55-60 percent citric acid, and 20-30 percent water. About 5.83 gallons of solution are used in the model units.

The units will be distributed to interested manufacturers of stainless steel articles after samples of the individual items have been treated at the Rustless plant in Baltimore, and found practical to electropolish.

Inquiries about these electropolishing units, and others of larger size to be built later, should be directed to the Market Development Division, Rustless Iron and Steel Corp., Baltimore 13, Md.

Acid-Proof Chemical Stoneware Bulletin

An 8-page bulletin recently issued by General Ceramics & Steatite details the full line of its Chemical Equipment Division's high grade acid-proof chemical stoneware. Standard equipment, a new line of completely engineered items, and interesting examples of special order work are included. Requests for this bulletin, CH. E-R. should be made on a company letterhead and addressed to General Ceramics & Steatite, Chemical Equipment Division, Keasbey, N. J.

Peelable Plastic "Liquid Envelope" Coating Announced

Better Finishes and Coatings, Inc., Newark, N. J. have issued a 16-page illustrated book describing the use, properties and technical data on their peelable plastic film, "LIQUID ENVELOPE."

This material has been used as a protective coating upon thousands of warplanes enroute overseas and is believed to have many peacetime applications, such as protecting laid-up tools or equipment; as a peelable protective-coating for finely-finished metal, wood or plastic surfaces during manufacturing operations, and as an easily-removed "plastic wrap" for shipping and warehousing.

Ask for Booklet MR-82 available without cost or obligation, from Better Finishes and Coatings, 168 Doremus Avenue, Newark 5, N. J.

Foster D. Snell, Inc., Announces Staff Additions

Miriam Lauren, formerly of the Rockefeller Institute for Medical Research, has joined the staff of Foster D. Snell, Inc., Brooklyn, N. Y. where she will have charge of the Micro-Analytical Laboratory now being enlarged to meet increasing industrial demands for this type of service. Mrs. Lauren is a graduate of Barnard College and holds her M.A. degree from Cornell University Medical School.

Gerald M. Compeau, recently research analytical chemist with the staff of Colgate-Palmolive-Peet Company, has also joined the Snell organization as assistant to the director of the Analytical Laboratory. Mr. Compeau is a graduate of Rutgers University.

HENRY STROW

May 1, 1945

Process of Coating with Tin or Other Metals

U. S. #2,374,926 to Colin G. Fink. A process of coating basis metals with a protecting coating which comprises heating the basis metal which may be copper, nickel or ferrous metal in a reducing gas and a halogen acid and while still subject to the atmosphere immersing it in molten bath consisting of tin, cadmium, zinc, lead or beryllium, this treatment causing wetting of the metal so that it forms a continuous, adherent coating.

May 8, 1945

Alloy Steel Pointing Plate

U. S. #2,375,210 to Clements Batcheller. A printing master comprising a plate of chromium containing alloy steel provided on the printing face thereof with an electrolytic grain and having an image forming substance superposed on predetermined zones of said face.

Method of Brightening Surfaces of Aluminum-Silicon Alloys

U. S. #2,375,394 to Martin Tusterud, assigned to Aluminum Company of America. Method of brightening an aluminum-silicon alloy surface which comprises making the surface anodic at a current density of 50-450 Amperes per sq. ft. in a solution containing 2-50% by weight of hydrofluoric acid, 5-75% by weight of glycerine and not less than 10% of water.

Apparatus for Copper Coating Ferrous Metal Strip

U. S. #2,375,434 to B. C. Moise and B. C. Moise, Jr. Apparatus and method of coating sheet ferrous alloys with molten copper are described.

Phosphate Coating of Metals

U. S. #2,375,468 to W. J. Clifford and H. H. Adams, assigned to Parker Rust-Proof Company. A composition consisting essentially of acid phosphate coating chemicals and an organic compound which contains the nitro group in sufficient quantity to act as accelerator.

Method of Producing Designs on Stainless Steel

U. S. #2,375,613 to Clements Batcheller. Method of producing a colored design on chrome alloy steel with a characteristic dark colored film of iron and chromium oxides which consists of coating those portions of the film which are desired to be preserved with a resistant coating and removing the color film from the uncoated portions by anodic action in a solution having good conductivity.

Cleaning Machine

U. S. #2,375,723 to Marcel J. A. Zinty, assigned to Magnus Chemical Co. A machine consisting of a tank with a basket therein and means provided to give the basket a vertical oscillatory motion.

May 15, 1945

Surface Treatment of Aluminum and Aluminum Alloys

U. S. #2,376,082 to Alfred N. D. Pullen, assigned to Aluminum Company of America. The process of producing a highly reflective surface on aluminum and alloys which comprises brightening and oxidizing said surface by anodic treatment in a hot alkaline brightening electrolyte, subjecting said brightened surface to further anodic treatment in an acid electrolyte adapted to produce an aluminum oxide film on the

brightened surface, heating the article in water to not less than 65° C., and then removing the oxide film by a mineral acid solution containing a soluble aluminum salt and a soluble fluoride.

Surface Treatment of Zinc and Cadmium

U. S. #2,376,158 to Russell McCarroll, J. L. McCloud and H. E. J. Hanson, assigned to Ford Motor Co. A method for the surface treatment of metals selected from the group consisting of zinc and cadmium to produce a high luster, durability, and a surface capable of being painted, comprising the step of immersing the metal in an aqueous bath containing about 120 grams per liter of chromic acid, 0.25 to 0.5 grams per liter of sulfuric acid and 0.8 to 1.2 grams per liter of nitric acid, the ratio of said chromic acid to the combined amount of the sulfuric and nitric acids being approximately 100 to 1.

May 29, 1945

Piston Cleaning Apparatus

U. S. #2,376,945 to Carl A. Stine, assigned to Turco Products, Inc. A cleaning apparatus consisting of a tank and automatic brushes to clean the work.

Cleaning Compositions

U. S. #2,377,066 to W. Baird, A. Hill, J. E. G. Harris, S. H. Oakeshott and W. J. Wilson, assigned to Imperial Chemical Industries, Ltd. A cleaning compound containing soap, a mild alkali, an oxidizing agent and a stabilizing agent.

Electrolytic Deposition of Cadmium

U. S. #2,377,228 to Charles G. Harford, assigned to Arthur D. Little, Inc. A solution for the plating of cadmium consisting essentially of a soluble salt of cadmium and an alkyl-hydrocarbon polyamine and manifesting a pH value between 9 and 10.3.

Electrolytic Deposition of Chromium

U. S. #2,377,229 to Charles G. Harford, assigned to Arthur D. Little, Inc. A solution for the electroplating of chromium consisting essentially of a soluble salt of chromium and an alkyl-hydrocarbon polyamine and manifesting a pH value below 7.0.

June 5, 1945

Enamel Coated Article

U. S. #2,377,321 to Morris Brown and R. E. Harr, assigned to Western Electric Co., Inc. — A method of forming an enamel coated article which comprises copper plating a ferrous metal base, electrodepositing an alloy of from 0.5 to 10.0% iron and the balance nickel on the copper plate and applying a vitreous enamel coating over the alloy plate.

Apparatus for Electrogalvanizing

U. S. #2,377,550 to Wesley Hall, assigned to Hanson-Van Winkle-Munning. — An apparatus for continuous electroplating of sheets with arrangement for entering and withdrawing through a slit in the ends of the tank thus keeping the sheet under the solution at all times.

Tin Plating of Aluminum

U. S. #2,377,606 to E. V. Blaekmun and M. P. Mikula, assigned to Aluminum Co. of America. — The process of tin plating aluminum articles comprising the steps of dissolving sodium acetate and an alkali metal stannate in water and subsequently immersing the aluminum articles in said solution for sufficient time to produce on said articles a coating of tin by chemical deposition from said solution.

Preventing Corrosion of Ferrous Metals by Solutions of Electrolytes

U. S. #2,377,792 to C. K. Lawrence and R. F. Engle, assigned to the Solvay Process Co. — Process of protecting a ferrous metal against corrosion by an aqueous solution of maleic acid which consists of passivating the surface with a chemicall oxidizing agent applying a controlled anodic charge to the surface.

June 12, 1945

Metal Cleaning Process and Composition

U. S. #2,377,876 to Harvey N. Gilbert, assigned to E. I. du Pont de Nemours & Co. — The process of removing metal oxide by immersing the metal surface in a molten composition consisting of an alkali metal hydroxide with 1 to 20% by weight of alkali metal hydride.

Pennsalt EC-10 does a quick, thorough job

Oils, greases, metal chips and shop dirt are quickly removed from steel bomb fuse plugs in the precleaning process with Pennsalt EC-10. Pennsalt K-7 is used in the subsequent Anodic Cleaning process.

This combination makes it possible for each eight hour shift to produce an average of 9700 fuse plugs with only 1/10 of 1% rejects—a step up in production of 15%.

The following is the actual case history of this operation.

FUSE PLUGS (BOMB)

PENNSALT EC-10 AND PENNSALT K-7 CLEANING PRIOR TO ZINC PLATING AND IRIDITE DIP

PROBLEM
To clean steel bomb fuse plugs free of oils, greases and filings prior to zinc plating and subsequent "Iridite" dip coating.

EQUIPMENT USED
A 200 gal. solvent dip tank followed by a spray rinse and a 325 gal. reverse current alkali cleaning tank followed by a dip rinse tank.

METHOD

PART 1—PRECLEANING

1. Use Pennsalt EC-10 concentrated, room temperature; soak for 30 seconds.
2. Cold water spray rinse.

PART 2—ANODIC CLEANING

3. Use Pennsalt K-7 at 50 to 100 amps./sq. ft. at 8 oz./gal., 200° F. for 30 seconds.
4. Hot water rinse.
5. Muriatic acid dip.
6. Cold water rinse.
7. Zinc Electroplate.
8. Hot water rinse.
9. Hot "Iridite" dip and then dry air.

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FRANK K. SAVAGE

Chairman, Program and Educational Committee

Cathode Surface Changes in the Presence of Gelatin During Electrodeposition of Copper

W. GAUVIN and C. A. WINKLER. *Can. J. Research* **21B**, 125-32 (1943).

The increase of cathodic polarization from additions of gelatin to acid copper baths indicates that the gelatin is adsorbed on the active centers and reduces the area of the cathode available for deposition. This causes an increase in the actual current density, resulting in an increase in polarization, an increase in the rate of nuclear formation and a decrease in grain size. Thus a very small amount of gelatin exerts a beneficial action on the deposit; as little as a fraction of 1 mg./l. (.0001 oz./gal.) radically changes the appearance of the deposit. A large amount so reduces the area available for deposit that the crystals are covered or smothered by gelatin before they have grown very far; if almost all the active centers are covered, the adherence is reduced and a powdery copper deposit results, as is observed.

ERNEST H. LYONS, JR.

Electrodeposition of Ag from solutions of $AgNO_3$ in the Presence of Wetting Agents

ROBERT TAFT and ERWIN N. HIEBERT. *Trans. Kansas Acad. Sci.* **46**, 142-60 (1943).

The electrodeposition of Ag from $AgNO_3$ solutions in the presence of 84 wetting agents was studied and the results of determination of masses and characteristics of deposits were recorded. Those wetting agents which decreased the grain size of the deposit were Aerosol 1B, diglycol stearate, ammonium laurate, ammonium stearate, Proflex, pyridine and tris (hydroxymethyl) aminomethane. Of these eight tris (hydroxymethyl) aminomethane gave the best deposit. Many types of deposits were encountered among which were striated, treed, nonadherent, spongy, fuzzy, powdery, discolored, brittle, dull-white and shiny deposits. Discolorations and low and high masses of deposits indicated that other reactions than just formation and discharge of simple Ag ion were taking place in some of the baths. In general, increase of c. d. and decrease of temperature caused a decrease in crystal size. The formation of large crystals was quite often accompanied by treeing. From this study, there seems to be no obvious relationship between the molecular structure of the wetting agent and the type of the deposit.

L. H. SEABRIGHT, *Chemical Abstracts*

Acid Copper Plating

W. GAUVIN and C. A. WINKLER. *Can. J. Research* **21A**, 37-50 (1943); *Chem. Abstracts* **37**, 5317 (1943).

Conflicting values of cathode polarization in acid copper sulfate baths have been reported. If the current density is above approximately 5.4 amp./sq. ft., definite values of polarization are obtained if the electrolysis is continued long enough for the cathode surface to reach a steady state. At lower

current densities, the basis-metal structure is continued in the deposit and the cathodic polarization depends on the initial surface condition of the electrode. The crystal size is related to the true current density, rather than to cathodic polarization.

ERNEST H. LYONS, JR.

The Rational Use of the Noble Metals in Chemical Technique

K. W. FROHLICH. *Chem. Tech.* **16**, 19-22 (1943).

The problem of protection against corrosion of Fe, steel and Cu by plating with Pt, Au, Ag and Ag alloys is discussed. The losses of Ag, Ni, monel and Ag-Mn alloy in HCl, H_2SO_4 or H_3PO_4 of various concentrations and temperatures for various periods of time are shown in 6 tables. A Pt-Au alloy resists hot H_3PO_4 better; Au with 25% Ag is as good as pure Au for plating, adheres better and has a harder surface; Ag with 0.1% Ni resists hot alkalies better and improves its mech. properties; Si increases the hardness and alkali resistance of Ag.

J. H. MOORE, *Chemical Abstracts*

The Structure of Electrodeposited Chromium

W. HUME-ROTHERY and M. R. J. WYLLIE. *Proc. Roy. Soc.* (London) **A181**, 331-44 (1943); *Chemical Abstracts* **37**, 6194 (1943).

The appearance and crystal orientation of electrodeposited chromium were studied at current densities between 50 and 3000 amp./sq. ft. and temperatures from 60° to 203° F. The brightest deposits are characterized by a (111) preferred orientation. There is no other indication of fiber structure. If the current densities are plotted against the log of the temperature for the brightest deposit, a straight line is obtained. As the temperature or current density varies from that giving the brightest deposits, the number of particles of random orientation increases, and the alignment of the preferred-orientation particles becomes less perfect. At a fixed current density, when the temperature of deposition increases, the residual stress in the deposit rises until the temperature is reached at which particles of preferred orientation appear; with further rise in temperature, the stress decreases to reach zero at the temperature giving the brightest deposit; with further rise in temperature, the stress increases again. The stress may be as high as 110 tons/sq. in. Hardness measurements are reported. The deposits of completely preferred orientation have the greatest hardness; this is the same for all current densities. The hardness depends solely on the structure as revealed by x-rays and is independent of the plating conditions under which the structure has been produced. The orientation in the electro-deposit does not depend on the structure of the basis metal. The bright deposits are plated at an efficiency of 8%.

ERNEST H. LYONS, JR.

The Anodic Formation of H_2O_2 by Superimposed Alternating Current

ALFONS KLEMENC. *Z. Elektrochem.* **49**, 141-58 (1943); cf. *C. A.* **34**, 3281.

The phys.-chem. behavior of the Zn electrode with a.c. and d.c. is discussed. The formation of H_2O_2 at the Zn anode by a super-imposed a.c. was studied. The effect of various factors, such as temperature, acidity, reproducibility of electrode, oxidation of the electrode during electrolysis, voltage and c.d., on the reaction was measured. The law of mass action applies. A diagram of the apparatus, including details of the cell is given.

W. GOERGE PARKS, *Chemical Abstracts*

Cathode Potential, Efficiency and Throwing Power of Nickel Plating

W. A. WESLEY and E. J. ROEHL. *Electrochemical Society Preprint* **86-6** *for meeting October 1944.*

Although data on the characteristics of older types of nickel plating solutions have long been available, information on the cathode potential and current efficiency of modern baths was incomplete. These characteristics of nickel chloride, hard nickel and Watts' plating solutions have been measured. Analysis of the data leads to the conclusion that the nickel chloride and hard nickel baths should show higher throwing power than either the low pH or

high pH Watts bath. Metal distribution data obtained in a Haring-Blum cell support this conclusion and also tend to verify the Gardam equation for current distribution.

FRANK K. SAVAGE, VINCENT MATTACOTTI

A Rotating Cathode Cell for Strip Plating Evaluation

D. A. SWALHEIM. *Electrochemical Society Preprint* **86-12** *for meeting Oct. 1944.*

A detailed description of a device for the study of strip plating by the use of a rotating cathode. The agitation provided by the rapid movement of the cathode steel strip fastened to the rotating cathode holder permits deposition of good quality deposits at current densities up to about 1,000 amp./sq. ft. (108 amp./dm.^{2}) at strip speeds of the order of 1,000 ft./min. (300 m./min.). Data illustrating the current-voltage relationships at various strip speeds and at various current densities, and data on plating range characteristics and cathode efficiencies of a commercial halogen tin plating solution as measured in the rotating cell are presented. A study of the sulfamate lead plating system is also included for the purpose of illustrating further applications of the cell.

FRANK K. SAVAGE, VINCENT MATTACOTTI

Electrodeposition on the Inside of Eccentric Cylinders

R. A. SCHAEFER and J. B. MOHLER. *Electrochemical Society Preprint* **86-8**, *for meeting of Oct. 1944.*

Experimental data are presented on the variation of the deposit on the inside of eccentric cylinders with an internal anode. These data are correlated with the theoretical current distribution between eccentric cylinders.

FRANK K. SAVAGE, VINCENT MATTACOTTI

Plastic Speeds Plating of Landing Gear Pistons

W. C. McDANIEL. *American Machinist*, **88**, No. 1, Jan. 6, 1944.

Use of Lucite to make protecting adaptors and furnish "stop off" protection has improved the distribution of plated chromium on Curtiss-Wright "Hell-Diver" landing gear pistons. Lucite is said to withstand alkaline cleaners and plating solutions and proves to be a good material to fabricate adaptors for threads and rack insulators.

CHESTER W. SMITH

Preparation of Copper Powder by Electrodeposition

A. W. HOTHERSALL and G. E. GARDAM. *J. Electrodepos. Tech. Soc.*, **20**, 61-68, 1945.

Results of a laboratory investigation carried out in 1934, on production of copper powder by electrolysis, are published. Recommended conditions of deposition are: $CuSO_4 \cdot 5H_2O$—50 g./L.; H_2SO_4—150 g./L., c.d. 72 A./sq. ft.; temp. 30°C. (cooling is necessary); anode area not less than cathode area; inter-electrode distance as small as possible. Powder was dislodged from lead cathodes by frequent knocking or jarring, by brushing every 15 minutes, and by thorough scouring every 12 hrs. It was periodically removed from tank bottom and washed, neutralized and washed again. Final product consisted of salmon-pink dendritic particles of which 90% passed a 100 mesh sieve but very little passed a 300 mesh sieve. Cost of production is analyzed and equipment for a pilot plant capable of producing 1 lb. of powder per hour is listed.

L. B. SPERRY

Protective Value of Electro-tin As An Undercoating

S. WERNICK. *J. Electrodepos. Tech. Soc.*, **20**, 47-60, 1944.

In plating cadmium, zinc or nickel over steel or cast iron, a comparatively thin undercoating of electrodeposited tin improves plate distribution and corrosion resistance, particularly on articles of complex shape. "Bent Cathodes" were used as test specimens, salt spray test, hot water test and outdoor exposure for corrosion testing. Graphs, photographs, tables and sketches are presented.

L. B. SPERRY

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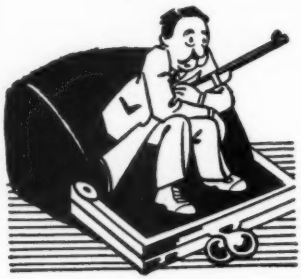

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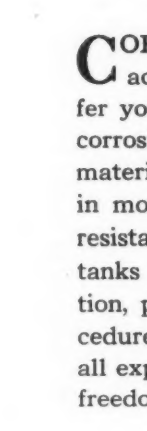

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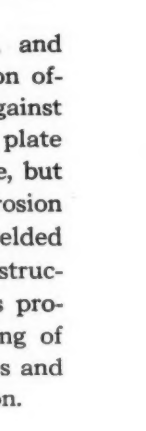

Manufacturers of Welded Fabrications to Specification

BRIDGEPORT BRANCH

The regular monthly meeting of the Bridgeport Branch of the American Electroplaters' Society was held Friday, June 1, 1945 at the Hotel Barnum. President H. C. Braun opened the meeting at 8:30 p.m. with thirty-three members and guests present.

William Ehrencrona, Chairman of the Banquet Committee, gave a report of the very successful banquet held May 26, 1945 at the Hotel Barnum. The Committee deserves special mention for a job well done. Also many thanks to Art McNeil and Harold Leever of the Mac Dermid, Inc., Waterbury, Connecticut, for their excellent entertainment. The following prizes were awarded:

George Morrow—$25.00 Bond
Miss Mary Morrisey—$5.00 War Stamps
Mrs. Thomas Barnes—$5.00 War Stamps
Mrs. Wm. Ehrencrona—$10.00 War Stamps

Under standing committees F. B. Gotthardt, Chairman of the Membership Committee, reported three applications for membership. The Sick Committee reported that Mr. Sullanosky, father of our member Stephen Sullanosky, has passed away. Our deepest sympathy is expressed to the family. The committee also reported the illness of Mrs. Helmle, wife of "Chick" Helmle, and Mrs. Phillips, wife of "Chick" Phillips. From late reports we hear both these fine ladies are well on the way to complete recovery from their illness. John B. Willett, son of our member Phillip A. Willett, has passed away. The branch members expressed their deepest sympathy to the family with a floral offering. The Publicity Committee reported progress and the Projector Committee reported that the film and sound projector is available to any member of our Branch.

President Herman C. Braun appointed an Outing Committee consisting of William Ehrencrona, Chairman, Raymond Kwasnik and Fred Gotthardt to arrange for an outing at William Ehrencrona's estate in Trumball for not over 100 persons including branch members and their wives. Time —12 o'clock, August 18, 1945.

Dr. W. R. Meyer conducted a round table discussion on the various problems of the plating and finishing industry for which he received a vote of thanks.

JOSEPH G. STERLING, *Sec'y & Treas.*

BRIDGEPORT BRANCH

An open meeting and Educational Session was held Friday, June 15, 1945 at 8:00 P.M. at the Hotel Barnum. President Herman C. Braun opened the meeting and, after a brief announcement and talk, called upon C. C. Helmle to preside as Technical Chairman with 46 members and guests present. After a few remarks concerning the meeting "Chick" Helmle called upon Mr. Harold Narcus, Chief Chemist of the Plating Processes Corporation, Holyoke, Mass., as the speaker of the evening whose subject was "The Deposition of Metal Coatings on Plastics." Mr. Narcus pointed out that the expansion of the plastics work during the post war period will be very large and will affect the demand for plated plastics. He showed samples of work including slides, illustrating the process involved in preparing work for plating in order to obtain a good metal bond and finish. Questions were ably and promptly answered. A rising vote of thanks was accorded to Mr. Narcus.

JOSEPH G. STERLING, *Sec'y & Treas.*

CHICAGO BRANCH

The Chicago Branch held the July meeting at the Midland Hotel on Friday, July 13, 1945. The convention delegate Mr. F. Savage reported by letter the business of the annual meeting. Mr. J. Hanlon and R. Hazucha reported that we would hold our next meeting in the new location mentioned below.

Mr. L. C. Borchert, acting as Librarian, introduced Mr. Fabry, Superintendent of rack design and construction for Belke Manufacturing Co., who spoke on "Rack Insulation and Stop-offs in the Plating Room." He answered many questions on rack insulation and synthetic materials. The following questions were in the "question box":

Q. How can one produce satin finish on 18-8 stainless steel by electro polishing? *A.* Variations in current will produce finishes ranging from dull through satin to bright.

Q. Is there any practical way to check adherence of copper plate to brass? *A.* Dip in oil at 350° F. for a few minutes.

Q. How can heavy gold plating be stripped from brass without too much attack on the base metal? *A.* Use 90% tack on the base metal? *A.* Use cold 90% phosphoric acid with the part as anode.

The August meeting will be the 400th meeting of the Chicago Branch. It will be held in the new meeting place, The Hamilton Hotel at 18 S. Dearborn St. An evening of reminiscence of the last thirty years of the Chicago Branch will be the Topic of the evening. All the "OLD TIMERS" should come and talk it over.

M. H. Longfield, *Secretary*

COLUMBUS BRANCH

The regular meeting was held at 8:00 P.M. on June 29, 1945. A short business meeting was held, in which the secretary reported a total membership of 36. Three applications were received and read, and one transfer requested. A report on the National Society Business Session was made by the branch delegate, Mr. William J. Neill. Arrangements have been made for a joint meeting of the Columbus Branch A.E.S. and Columbus Branch A.S.M. to be held on April 9, 1946, for a forum on Protective Coatings.

The speaker of the evening was Mr. Wilson B. Green of Detrex Corporation, who gave an interesting demonstration of vapor and solvent degreasing accompanied with a film illustrating the fundamentals of proper degreasing. The talk was greatly appreciated by everyone.

The use of the Magne-Gage and the dropping test for thickness measurements, their applications and limitations were discussed by Mr. William Neill, Eugene E. Hebert and Charles W. Bates.

David S. Stoker, *Secretary*

ST. JOSEPH VALLEY BRANCH

A meeting to form a local branch of the American Electroplaters' Society was held on Thursday evening, April 26, 1945 at the Bendix Post American Legion Hall in South Bend, Indiana. Forty-five men attended this meeting, a number of them being members of the A.E.S. Mr. J. C. Badaluco opened the meeting with a few remarks relative to the purpose of this meeting. Mr. Maurice Caldwell, National President, and Mr. Frank Savage, Nat'l 2nd Vice-President, were introduced by Mr. Badaluco.

Mr. Caldwell gave a talk on the benefits and privileges of membership in the A.E.S. Upon the request of Mr. Caldwell for a proposed name for this Branch, the "St. Joseph Valley Branch" was submitted.

With Mr. Caldwell presiding the following officers were elected:

President, Mr. John Lockerbie, Goshen
1st V. P., Mr. K. Harlen, South Bend
2nd V. P., Mr. F. Craven, South Bend
Secretary, Mr. Geo. A. Bock, Jr., Elkhart
Treasurer, Mr. Clifford E. Crouch, Elkhart
Librarian, Mr. Duke Wysong, South Bend
Board of Managers: Mr. E. Hofferbert, South Bend, Mr. Chester McDowell, Elkhart, Mr. Ted Shafer, South Bend.

Mr. J. Lockerbie took charge of the meeting and was presented with a gavel by Mr. Caldwell in behalf of Ellen M. Servis, reading the following letter:

"To this newly organized branch of the A.E.S. I am indeed most grateful for the opportunity to be able to present to you this gavel presented to my father, Oscar E. Servis, on June 24, 1916 upon being elected to the Presidency of that great organization The American Electroplaters Society.

"I am sure this new branch will be accorded the same great success that has followed Chicago Branch all through these years.

"With sincerest regards for the continued success of the American Electroplaters Society, I am

"Respectfully yours,
"Ellen M. Servis"

A motion was passed establishing the name "St. Joseph Valley Branch." The secretary was instructed to write the National organization to secure a temporary charter and the necessary supplies. It was then voted to make the membership dues $6.00 per year. Mr. Fred Craven, 2nd V. P., was asked to form a committee to keep activities alive during the summer months. Mr. Hofferbert reported that the Oliver Hotel would be available for the next meeting to be held Wednesday evening, May 23, 1945.

A very interesting paper was presented by Mr. Frank Savage on bi-polarity along with colored motion pictures showing anode and cathode reactions.

A rising vote of appreciation to the J. C. Miller Company for their excellent cooperation in getting this group together.

GEO. A. BOCK, JR., *Secretary*

ST. JOSEPH VALLEY BRANCH

The first regular meeting of the St. Joseph Valley Branch was held May 23, 1945 in the Rotary Room of the Oliver Hotel, South Bend, Indiana. Seventy-one members and guests attended the dinner and meeting.

The temporary Charter of the St. Joseph Valley Branch was presented by Mr. Frank Savage with his congratulations and the best wishes of the Executive Committee of the Supreme Society. President John Lockerbie in reply expressed the appreciation and thanks of the Officers and Members of the Branch in accepting of the Temporary Charter. Mr. Frank Savage upon request by John Lockerbie then gave a talk on the advantages of Membership in the A.E.S.

A motion was passed that the Board of Managers select a delegate to represent our newly formed Branch at the Annual Meeting in June.

Sound and color motion pictures on the History of Aluminum were shown through the courtesy of the Aluminum Company of America. Following this Mr. John Bryden of the Chicago Thrift Company of Chicago, Ill. gave an interesting talk on the Alumilite Process after which questions were ably answered.

GEO. A. BOCK, JR., *Secretary*

WATERBURY BRANCH

Waterbury Branch closed its spring session at the meeting held June 22nd at the Hotel Elton. As usual a number of members met at dinner at 6:30 P.M. in the Colonial Room and at 8:00 P.M. the meeting was opened by President W. L. Cassell. The business of the evening opened with the election of John Misura and George Hisert to associate memberships.

David Maitland, acting as Technical Chairman, introduced George Dubpernell in his regular monthly book review. George chose to review "Protective and Decorative Coatings" by J. J. Mattiello.

Bill Starr discussed the lifting of restrictions on copper. While it is possible to place orders without ratings, rated orders, of course, take precedence and these unrated orders are no doubt subject to considerable delay in being filled. Orders for equipment may also be placed without ratings, but the same condition prevails here.

Henry Strow, in discussing new developments, told us of shot blasting of plated coatings and spoke also of continuous purification of plating solutions, particularly of nickel solutions.

The main feature of the program was a film entitled "Die Casting," provided through the courtesy of the New Jersey Zinc Co. This film is in technicolor and showed in detail methods of making all kinds of die castings, both simple ones and those of very intricate design.

Tony Maz, our delegate to the Society, gave a detailed account of the activities and accomplishments of the annual meeting in Pittsburgh.

S. L. HENN, *Secretary*

Dayton Branch Elects Officers

The new officers of Dayton Branch are: President, W. E. Moline; 1st Vice-President, John F. Beaver, Jr.; 2nd Vice-President, Ralph Collins; Secretary-Treasurer, Ralph Clinefelter; Librarian, Capt. Julius Teres; Board of Managers: E. L. Luaces, George Mitchell, Stephan Putzan.

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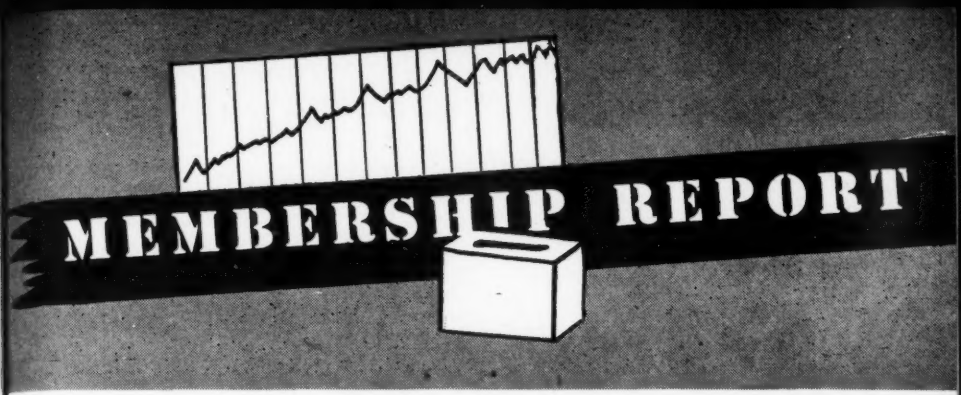

RAYMOND J. O'CONNOR
Chairman, Membership Committee

ELECTIONS

Boston Branch

Leslie W. Currier, Amesbury Specialty Co., Amesbury, Mass.
Paul S. Lakjer, 6 Cottage St., Fairhaven, Mass.
John Prescott, Jr., 855 Eastern Ave., Malden, Mass.

Buffalo Branch

Henry G. Wall, 128 Westminster, Buffalo, N. Y.

Chicago Branch

E. J. Fox, 727 Hess Ave., Evansville, Ind.
H. J. Bellemore, % C. G. Conn Ltd., Elkhart, Ind.
J. P. Wiley, 1435 S. Kostner Ave., Chicago 23, Ill.
W. Spence, 4720 Montana St., Chicago, Ill.
D. Neal, 609 Parson Ave., Des Plaines, Ill.
W. Couch, 4442 W. Van Buren St., Chicago 24, Ill.
L. Wybel, 20 N. Wacker Dr., Chicago 6, Ill.
S. Goodwin, Jr., % C. G. Conn Ltd., Elkhart, Ind.
T. Kolar, 644 Anderson Blvd., Geneva, Ill.
K. Makins, 444 W. St. James Pl., Chicago, Ill.

Dayton Branch

Robert D. Miller, 1194 Delta Road, Springfield, Ohio

Jackson-Lansing Branch

Burton H. Wright, R.F.D. #1, Dexter, Mich.

Montreal Branch

M. Clyde Arnold, 319 Grosvenor Ave., Westmount, Que.
Edw. H. Harrington, % Canadian Ingersoll-Rand Co., Sherbrooke, Que.

Providence-Attleboro Branch

Ernest Whitwam, 60 Maple Ave., Thornton, R. I.
Cecil Bailey, Box 248, Chartley, Mass.
Raymond Jette, 54 Union St., Attleboro, Mass.

Rochester Branch

Wm. Howard, 145 Canton St., Rochester, N. Y.
George H. Hibbard, 119 Delaware St., Rochester, N. Y.

Rockford Branch

John J. McCarthy, Keystone Steel & Wire Co., Peoria, Ill.
Erwin Ray Wright, 2016 Melrose St., Rockford, Ill.
John H. Buehler, Keystone Steel & Wire Co., Peoria, Ill.
E. W. Langenberg, Keystone Steel & Wire Co., Peoria, Ill.

Syracuse Branch

Peter J. Variello, Jr., 915 Butternut St., Syracuse 8, N. Y.

Waterbury Branch

George A. Hisert, Waterbury Companies, Waterbury, Conn.
John Misura, Jr., Torringford St., Torrington, Conn.

APPLICATIONS

Bridgeport Branch

Kenneth J. Lamond, 355 Booth Hill Rd., R.F.D. #18, Bridgeport, Conn.

Carl Matkowski, 46 Waverly Place, Bridgeport, Conn.

Frederick L. Hintze, % Harshaw Chemical Company of N. Y., 420 Lexington Ave., New York City.

Chicago Branch

W. I. Zinn, 609 W. Fulton St., Chicago, Ill.

J. Zito, 706 S. Morgan St., Chicago 7, Ill.

R. Stark, 1622 Sherwin Ave., Chicago 26, Ill.

E. J. Fox, 727 Hess Ave., Evansville, Ind.

H. J. Bellemore, % C. G. Conn Ltd., Elkhart, Ind.

J. P. Wiley, 1435 S. Kostner Ave., Chicago 23, Ill.

Columbus Branch

Eugene E. Hebert, 31 E. Livingston St., Columbus, Ohio

Charles W. Bates, 31 E. Livingston St., Columbus, Ohio

Walter J. Zang, 630 S. Sixth St., Columbus, Ohio

Jackson-Lansing Branch

Theodore W. Mack, 3240 Book Tower, Detroit, Mich.

Herbert A. Simonds, Stockbridge, Mich.

Providence-Attleboro Branch

Halliday E. S. Thompson, 96 West St., Attleboro, Mass.

St. Joseph Valley Branch

George Ellis Nidy, Box #35, Three Rivers, Mich.

Donald F. Fust, 204 W. High, Dowagiac, Mich.

Forrest W. Robison, 312 So. 8th St., Goshen, Ind.

Richard M. Tuthill, Villa Apt., Cleveland Rd., South Bend 17, Ind.

James M. Hedges, 205 E. Telegraph St., Dowagiac, Mich.

Charles J. Baldwin, 516 E. 6th St., Michigan City, Ind.

Otis A. Ray, 319 Oakridge Ave., Goshen, Ind.

Alfred B. Matern, 730 E. Pennsylvania Ave., South Bend 18, Ind.

John A. Baumgardner, R. R. #3 W. Lexington Rd., Elkhart, Ind.

Frederic H. Craven, 622 Park Ave., South Bend 16, Ind.

Clare E. Luke, 604 N. Main St., Berrin Springs, Mich.

Elmer E. Lepel, 328 Michigan St., Niles, Mich.

Raymond A. Friend, National Standard Co., Niles, Mich.

Orville E. Adler, National Standard Co., Niles, Mich.

Worth W. Mathews, 522 Winsted St., Kalamazoo, Mich.

Chester E. Prough, Excel Corp., 1120 N. Main St., Elkhart, Ind.

Frank H. Negley, 306 National Bank Bldg., South Bend, Ind.

James E. Gray, 601 W. High St., Elkhart, Ind.

Clare E. Ransbottom, 1039 Taylor St., Elkhart, Ind.

Donald R. Cook, 2206 S. Main St., Elkhart, Ind.

Victor E. Peterson, 1641 Hickory St., Niles, Mich.

Harry S. Deitrich, 1611 Cherry St., Niles, Mich.

Henry F. Welling, R. R. #1, Dowagiac, Mich.

E. V. Wiley, 312 N. Third St., Goshen, Ind.

Charles E. Lichtenberger, 136 Michigan St., Elkhart, Ind.

Claude Leroy Funk, 1333 E. Beardsley Ave., Elkhart, Ind.

Julius A. Farkas, 2618 Bulla Rd., South Bend, Ind.

John W. Saylor, 749 29th St., South Bend, Ind.

Sterling Wiener, 2917 Prast Blvd., South Bend, Ind.

Glenn R. Nunemaker, Lapaz, Ind.

Darrel E. Evans, 1723 S. Main St., South Bend, Ind.

TRANSFERS

W. T. Seiter from Chicago Branch to Rockford Branch

E. Brady from Chicago Branch to St. Joseph Valley Branch

C. McDowell from Chicago Branch to St. Joseph Valley Branch

Elmer F. Stephan from Detroit Branch to Columbus Branch

E. Fasson from Rochester Branch to Los Angeles Branch

SUSPENSIONS

Boston Branch

Edmund W. Kindred

Frederick D. Burney

DEATHS

Springfield Branch

H. J. Harter

Toronto Branch

W. C. Barrows

MEMBERSHIP CHART

BRANCH	May 1945	Change in Membership	Percent Change
FIRST GROUP			
PHILADELPHIA	154	+11	+ 7.2
CLEVELAND	143	+ 5	+ 3.5
CHICAGO	357	+11	+ 3.1
BOSTON	157	+ 4½	+ 2.9
NEWARK	213	+ 6	+ 2.8
DETROIT	390	+10	+ 2.6
WATERBURY	122	+ 3	+ 2.5
LOS ANGELES	151	+ 3½	+ 2.3
BRIDGEPORT	118	+ 2	+ 1.7
GRAND RAPIDS	121	+ 2	+ 1.7
INDIANAPOLIS	112	+ 1	+ 0.9
BALTIMORE-WASH.	123	+ 1	+ 0.8
ST. LOUIS	116	—	—
NEW YORK	191	—	—
TORONTO	119	— 1	— 0.8
HARTFORD	126	— 6	— 4.8
SECOND GROUP			
ROCHESTER	90	+ 4½	+ 5.0
PROV.-ATTLEBORO	101	+ 5	+ 4.9
PITTSBURGH	80	+ 2½	+ 3.1
BUFFALO	89	+ 1½	+ 1.7
MILWAUKEE	107	—	—
NEW HAVEN	106	— ½	— 0.5
DAYTON	109	— 5½	— 5.0
THIRD GROUP			
ROCKFORD	23	+14	+61.0
TWIN CITY	52	+12½	+24.1
AUSTRALIA	51	+10	+19.6
TOLEDO	54	+ 9	+16.7
SYRACUSE	57	+ 5	+ 8.8
SAN FRANCISCO	55	+ 3	+ 5.5
LANCASTER	39	+ 2	+ 5.1
JACKSON-LANSING	62	+ 1	+ 1.6
SPRINGFIELD	73	+ ½	+ 0.7
CINCINNATI	57	—	—
MONTREAL	54	— 1	— 1.9

Membership May 1, 1945	= 3972	Gain in Membership	= 128
Membership Aug. 1, 1945	= 4100	Per Cent of Gain	= 3.2

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BOSTON meets at the Hotel Statler, Boston, Mass., first Thursday each month. Secretary, A. W. Garrett, 35 Rosemont St., Dorchester, Mass.

BRIDGEPORT meets first and third Friday of each month at Barnum Hotel. Secretary-Treasurer, Joseph G. Sterling, 134 Colony St., Bridgeport 8, Conn.

BUFFALO meets second Friday of each month at Hotel Statler, Buffalo, N. Y. Secretary J. C. Mays, Alfred, N. Y.

CHICAGO meets second Friday of each month at 8 p.m., Hamilton Hotel, 185 Dearborn St. Secretary, M. H. Longfield, 1528 South 61 St., Cicero 50, Ill.

CINCINNATI meets on fourth Thursday of each month at 8 p.m., at the Engineering Society Headquarters, McMillan St. and Woodburn Avenue, Cincinnati, Ohio. Secretary-Treasurer, Elliott W. Horning, 2425 Kenilworth Ave., Norwood 12, Ohio.

CLEVELAND meets first Saturday of each month at Cleveland Hotel. Secretary-Treasurer, Harvey P. Heil, 12901 Elmwood Ave., Cleveland 11, Ohio.

COLUMBUS meets last Friday of each month at the Battelle Memorial Institute Auditorium, 505 King Avenue, Columbus 1, Ohio at 8:00 p.m. Secretary, David S. Stoker, 1338 Meadow Road, Columbus 8, Ohio.

DAYTON meets second Friday of each month at the Engineers Club, Dayton, Ohio. Secretary-Treasurer, Ralph L. Clinefelter, West Milton, Ohio.

DETROIT meets the first Friday of each month at the Hotel Statler. Secretary-Treasurer, F. L. Clifton, 16536 Inverness, Detroit 21, Mich.

GRAND RAPIDS meets second Friday of each month, 7:30 p.m., at the Rowe Hotel. Secretary, R. Perkins, 916 Fairmount St., S.E., Grand Rapids 6, Mich.

HARTFORD meets third Monday of each month at Hotel Garde, Hartford, Conn. Secretary, F. W. Smith, 46 Cottage St., Meriden, Conn.

INDIANAPOLIS meets at the Hotel Riley, the first Wednesday of each month. Secretary-Treasurer, Quenton Shockley, 4952 W. 12th St., Indianapolis, Ind.

JACKSON-LANSING meets second Tuesday of each month alternating between Home Dairy at Lansing and Hotel Hayes at Jackson. Secretary-Treasurer, R. E. Brown, 3851 Dobie Rd., Okemos, Mich.

LANCASTER meets second Friday of each month at 8 p.m., at Thaddeus Stevens Industrial School, Lancaster, Pa. Secretary-Treasurer, W. H. Fordney, 603 Marietta Ave., Lancaster, Pa.

LOS ANGELES meets the second Monday of each month, 6:30 p.m. at the Rosslyn Hotel, corner Fifth and Main Sts. Secretary-Treasurer, Frank Bunker, 2030 Bay St., Los Angeles, Calif.

MILWAUKEE meets first Friday of each month at Wisconsin Hotel. Secretary-Treasurer, James Durnford, 2370 N. 32nd St., Milwaukee 10, Wis.

MONTREAL meets first Monday of each month at Mount Royal Hotel, Montreal, Quebec, Canada. Secretary-Treasurer, Estelle Gravet, 267 Demarchais Blvd., Verdun, Quebec, Canada.

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NEW HAVEN meets the first Tuesday of each month at Sterling Chemistry Laboratory, Yale University. Secretary-Treasurer, B. J. Gaffney, 40 Filbert St., Spring Glen, Hamden 14, Conn.

NEW YORK meets second and fourth Fridays of each month, in the Hotel Pennsylvania, 7th Ave. and 33rd St., New York City, N. Y. Secretary-Treasurer, Franklyn MacStoker, 25 Princeton St., Garden City, L. I., N. Y.

PHILADELPHIA meets fourth Friday of each month, in the Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Sts. Secretary, Paul Mentzer, Sr., 7242 Bingham St., Philadelphia 11, Pa.

PITTSBURGH meets third Thursday of each month, at 6:30 p.m. at the Roosevelt Hotel, Pittsburgh, Pa. Secretary-Treasurer, Frank Keller, 1102 Hiland Ave., Coraopolis, Pa.

PROVIDENCE-ATTLEBORO meets the third Monday of each month at the Providence-Baltimore Hotel. Secretary-Treasurer, Chas. C. Chace, 11 Friendly Road, Cranston 10, Rhode Island.

ROCKFORD, Secretary, Stuart Golding, 205 Washington St., Rockford, Ill.

ROCHESTER meets third Friday of each month at the Hotel Seneca, Rochester, N. Y. Secretary-Treasurer, Donald C. Blum, 672 Mt. Read Blvd., Rochester, N. Y.

SAN FRANCISCO meets the last Thursday of each month, usually at Angelo's, 4307 San Pablo Avenue, Oakland, Calif. Secretary-Treasurer, J. R. Pattenger, 170 Division St., San Francisco 3, Calif.

SPRINGFIELD meets the fourth Monday of each month at the Hotel Charles. Secretary-Treasurer, Paul Lyman, Westinghouse Electric & Mfg. Co., 653 Page Blvd., Springfield, Mass.

ST. JOSEPH VALLEY. Secretary, George Bock, Jr., 177-179 E. Marion St., Elkhart, Indiana.

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SYDNEY, AUSTRALIA. Secretary-Treasurer, Lawrence Smith, Box 2064, G.P.O., Sydney, Australia.

SYRACUSE meets second Friday of each month at Bowne Hall, Syracuse University, Syracuse, N. Y. Secretary, Neil Maffei, 206 Union Ave., Syracuse 3, N. Y.

TOLEDO meets first Thursday of each month, in the office of the Vic Miner Co., 329 20th Street, Toledo, Ohio. Secretary, Gaston Bergeman, 703 Pine St., Fremont, Ohio.

TORONTO meets second Friday of each month at Royal York Hotel. Secretary, E. P. Blandy, 369 Prince Edward Drive, Toronto 9, Ont., Canada.

TWIN CITY, Secretary-Treasurer, Robert Buckley, 1410 Quincy St., N.E., Minneapolis 13, Minn.

WATERBURY meets second Friday of the month at Elton Hotel. Secretary-Treasurer, Spencer L. Henn, Apothecaries Hall Co., Waterbury 88, Conn.

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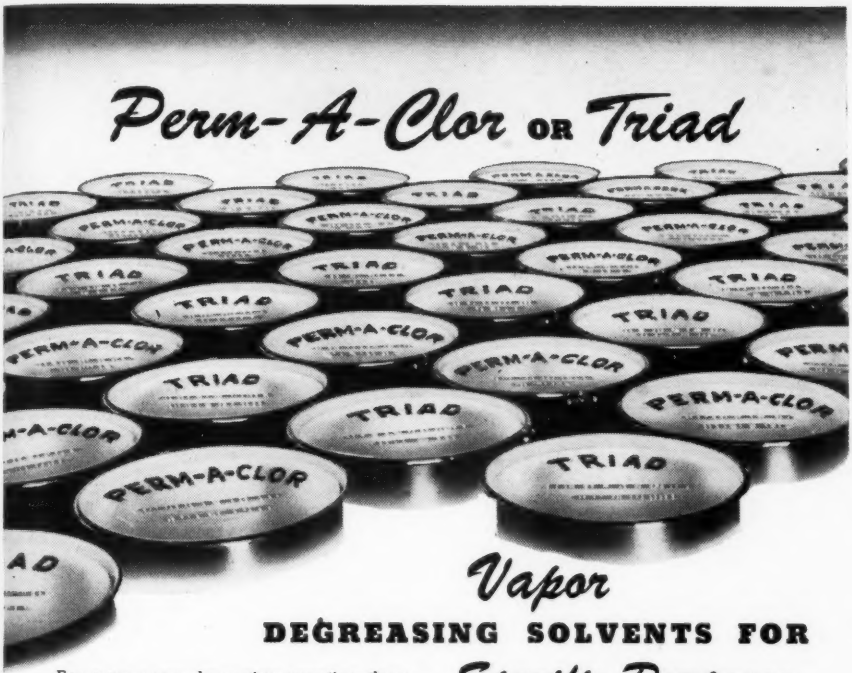

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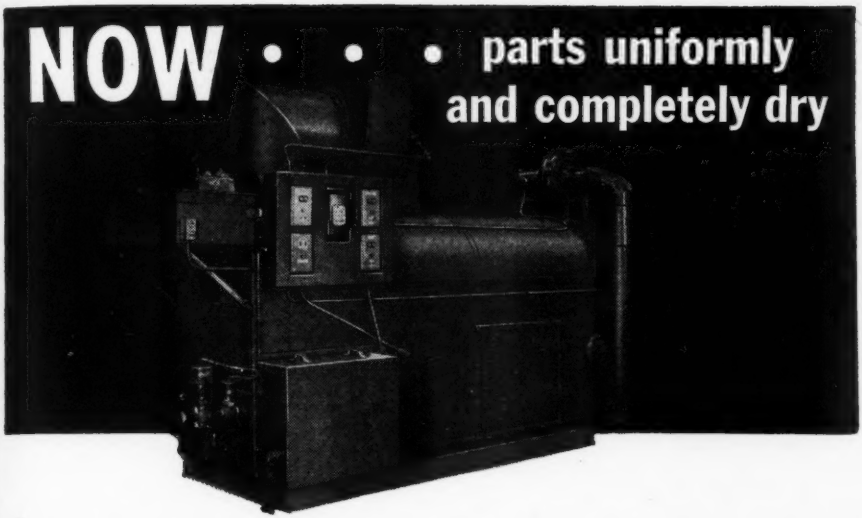

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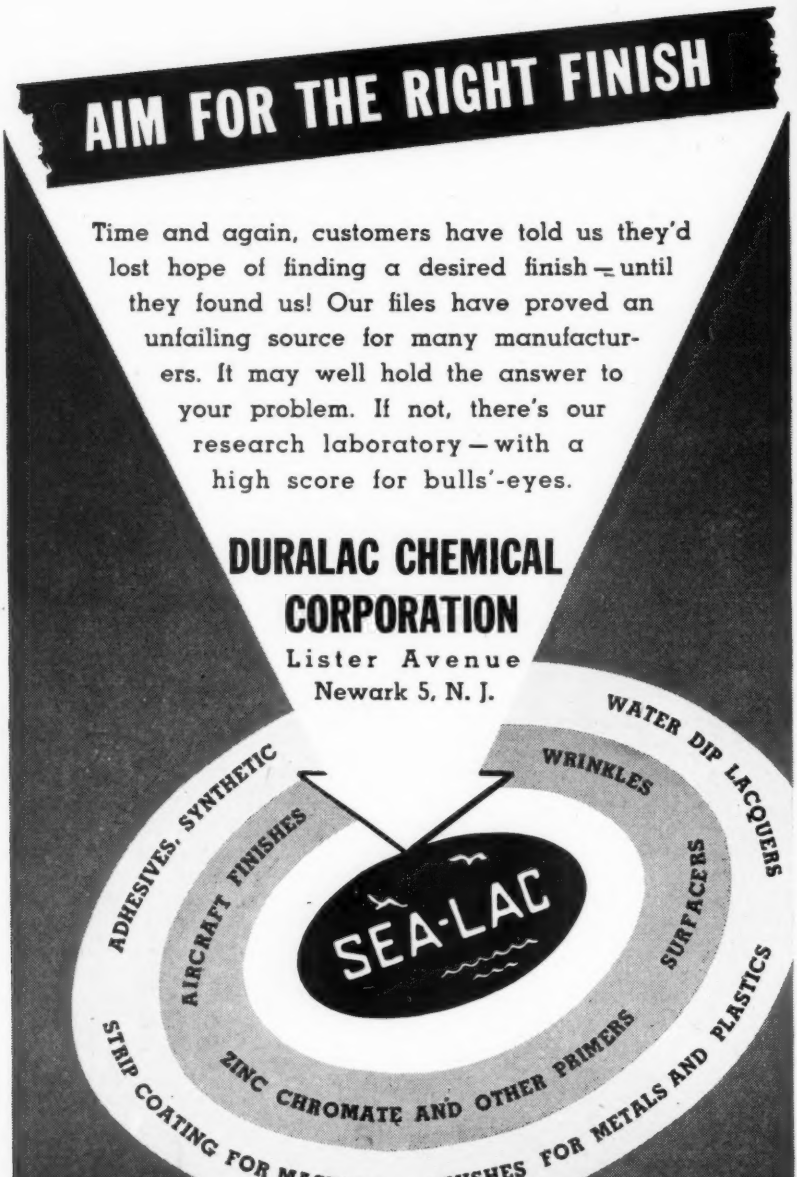
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(*Continued from page* 782)

revolves the piece approximately 60 rpm. The bottom portion of the spindle on which the work holder is mounted engages a cam airvalve.

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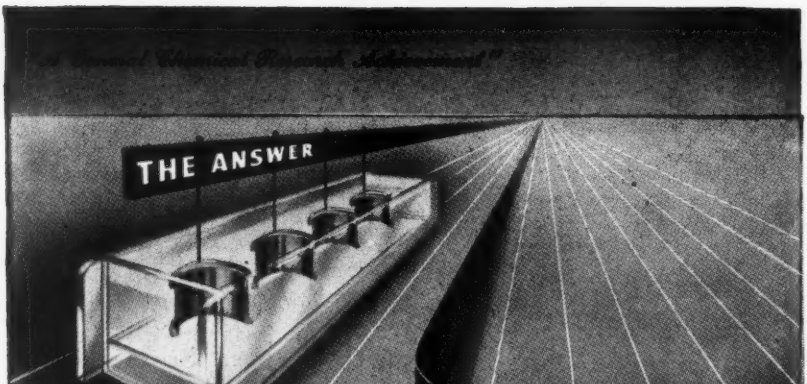

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A CASE OF STEEL EMBRITTLEMENT

(*Continued from page* 786)

The failed spring clip was not brittle as received. Strips of metal from either side of the fracture and from areas remote from the fracture could be bent through an angle of about 30° before fracture occurred. This does not mean that the material could not have been embrittled at the time of the failure, however, because carbon steel embrittled by hydrogen usually will regain its ductility at ordinary temperatures by diffusion of the occluded gas. The time required for this varies with the conditions which obtain in each case.

The statement that a change in the design of clips which entailed a reduction in the number of spot welds also materially reduced the total number of failures indicates that the welding operation was a factor of major importance in their production. This conclusion is supported by the presence of intercrystalline cracks in and near the welds as pointed out above. These cracks probably were formed during the austenite-to-martensite transformation resulting from a rapid rate of cooling after welding. It is possible that sound welds without martensite could be produced by pre-heating the clips to a temperature of 600-700° F. prior to spot welding. It is probable that clips with sound welds free from the attendant microscopic cracks could be successfully zinc plated. Such welds would be desirable whatever type of coating is used. Martensitic welds certainly would not be recommended in a carbon steel spring which is supposed to withstand a considerable amount of bending.

RESEARCH COMMITTEE MEETING

(*Continued from page* 803)

veloped from the literature and/or by experimentation. Furthermore, upon publishing no reference shall be made to any proprietary names or firms other than acknowledgment for information released without restriction for use by the Committee."

The Secretary reported that the annual report of the officers and committees and the research paper on "The Effect of Polishing on the Protective Value of Plated Coatings on Cold Rolled Steel" were both available in pamphlet form for distribution to the members.

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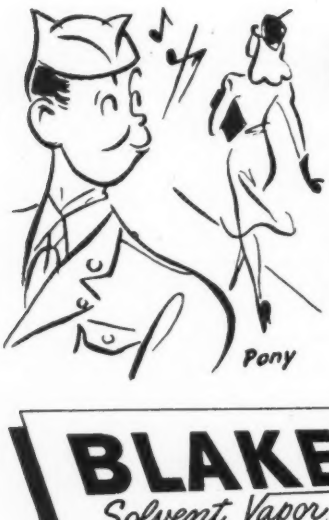

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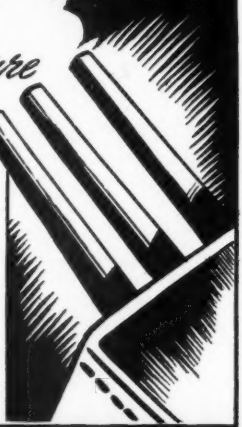

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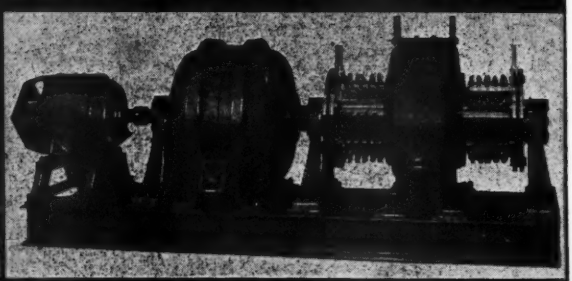

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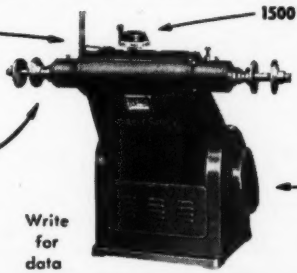

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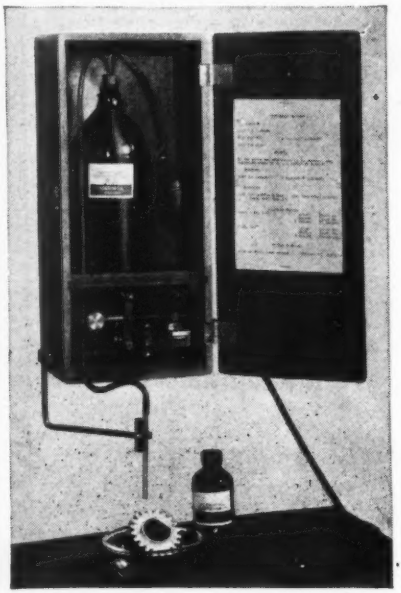

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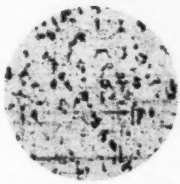

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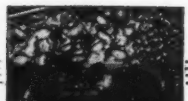

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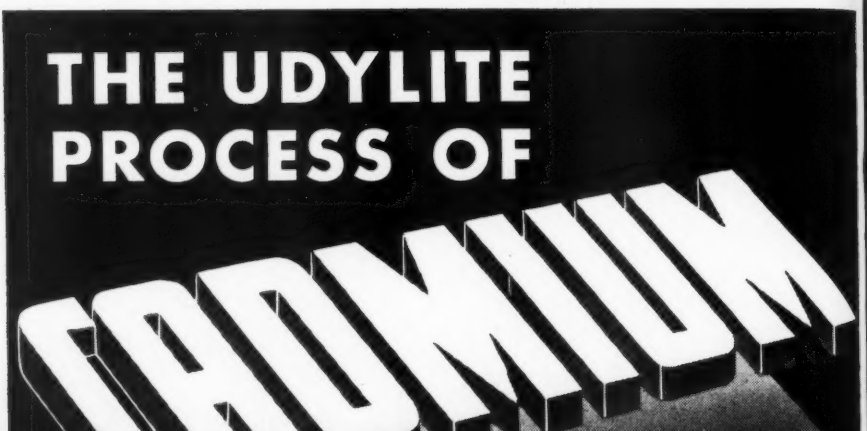

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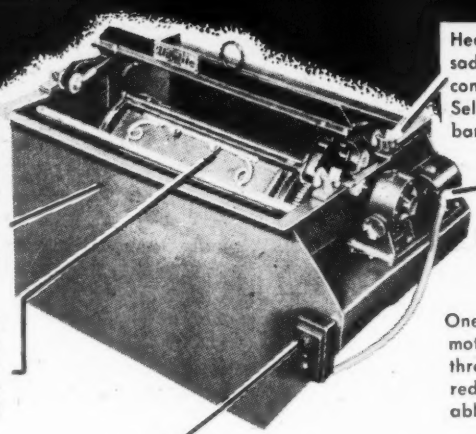

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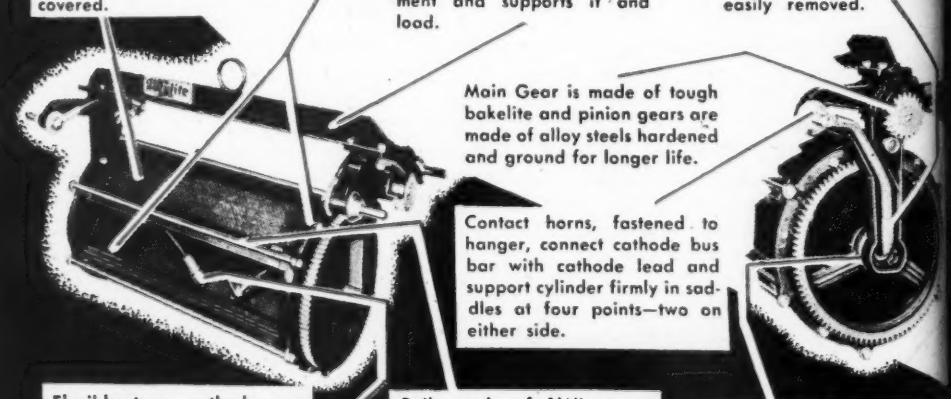
easily removed.



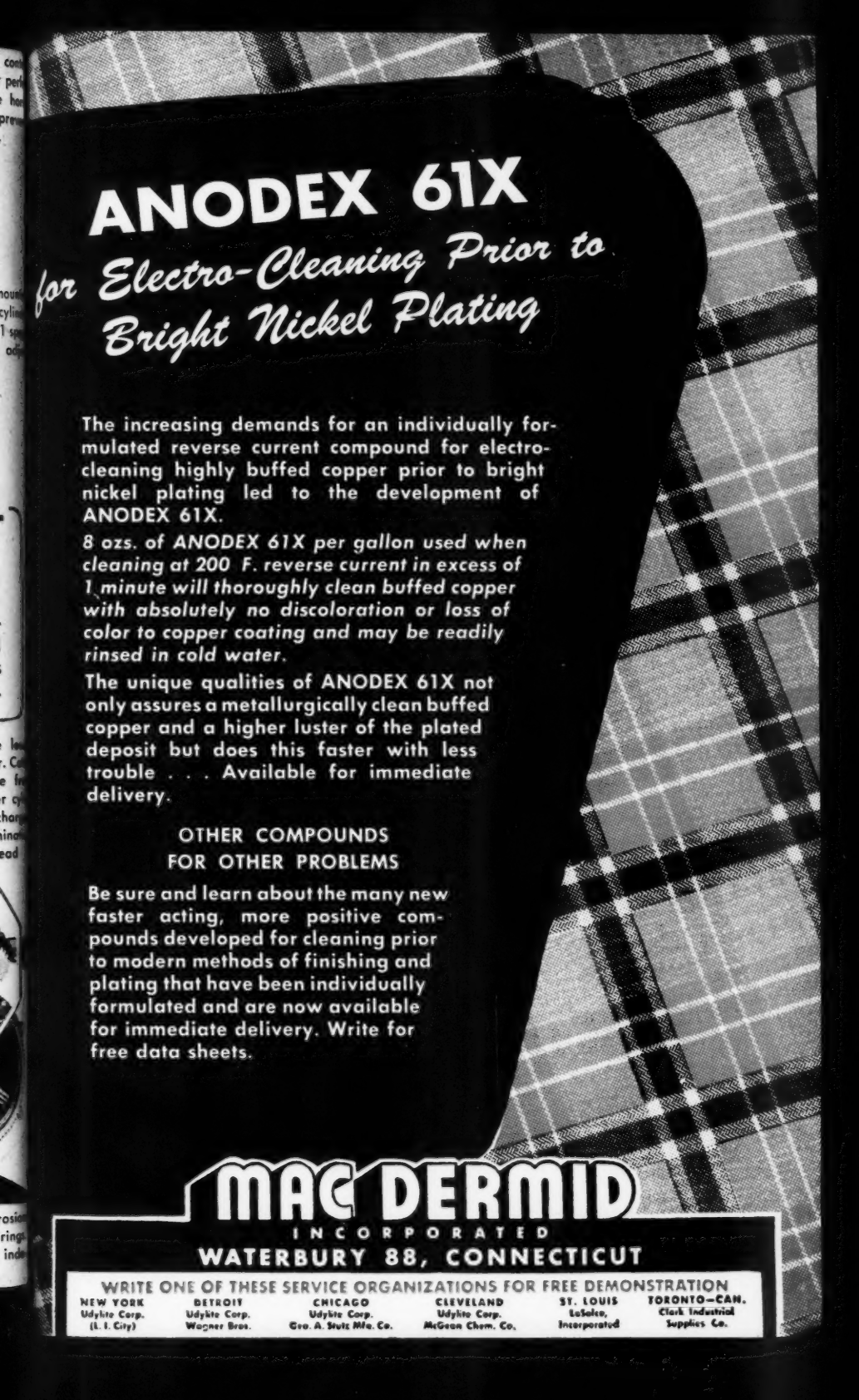
Main Gear is made of tough bakelite and pinion gears are made of alloy steels hardened and ground for longer life.

Contact horns, fastened to hanger, connect cathode bus bar with cathode lead and support cylinder firmly in saddles at four points—two on either side.

Flexible type, cathode contacts shown are standard for small work. We supply other types of contacts to meet requirements. Contacts are easily—quickly removed for cleaning.

Rails made of 1¼" square bakelite with a ½" diameter steel rod thru the center for reinforcement and running the entire length. Rails are milled to sui the panels insuring a good

Cylinder rotates on corrosi
resistant non-treeing bearing
The cathode arbors are inde
pendent of the bearings.


ANODEX 61X
for Electro-Cleaning Prior to Bright Nickel Plating
The increasing demands for an individually formulated reverse current compound for electro-cleaning highly buffed copper prior to bright nickel plating led to the development of ANODEX 61X.
8 ozs. of ANODEX 61X per gallon used when cleaning at 200 F. reverse current in excess of 1 minute will thoroughly clean buffed copper with absolutely no discoloration or loss of color to copper coating and may be readily rinsed in cold water.
The unique qualities of ANODEX 61X not only assures a metallurgically clean buffed copper and a higher luster of the plated deposit but does this faster with less trouble . . . Available for immediate delivery.
OTHER COMPOUNDS FOR OTHER PROBLEMS
Be sure and learn about the many new faster acting, more positive compounds developed for cleaning prior to modern methods of finishing and plating that have been individually formulated and are now available for immediate delivery. Write for free data sheets.
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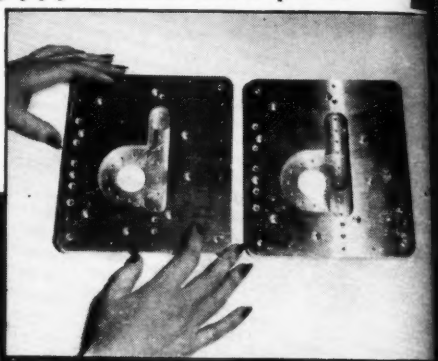
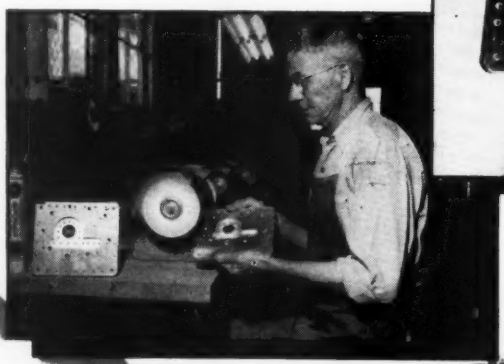
LEA Shows the Way

THE PIECES . . . *cast aluminum plates*

THE PLACE . . .

Pacific Gear Plant
Western Gear Works
Vernon, California





ARMY E NAVY

Here is a scene typical of those in countless plants where finishing operations are carried on. A bench, a wheel, Lea Compound or Learok and a skilled workman deburring, polishing or buffing a piece by a method devised with the help of the Lea Technical Staff.

Yes, the proper finishing of metals and non-metals calls for a thorough knowledge of the behavior of materials during the various finishing operations. It calls for the broadest experience in finishing . . . in burring, in polishing, in buffing.

It is here that LEA fits into the picture. We have the "greaseless" and "no free grease" compositions—lots of different grades, but it is on our technical service and sound recommendations that we have built and are maintaining our reputation as "Authorities on Finishing Operations."

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Waterbury 86, Connecticut

Burring, Buffing and Polishing . . . Manufacturers and Specialists in the Development of Production Methods and Compositions